

WADDAMANA 'A' POWER STATION TASMANIA

1916 - 1965



NATIONAL ENGINEERING LANDMARK SUBMISSION

T 1995
WADDAMANA 'A' N.E.L. SUBMISSION AND CEREMONY REPORT

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PREAMBLE

Water wheels have been used throughout the ages and in the mid 1800s there were some 80 water driven flour mills in Tasmania.

The electrical generator became practical when Siemens Bros produced the first working direct current dynamo in 1865.

The development of high head water turbines became practical when Pelton demonstrated the first successful impulse turbine in 1878.

In 1885 patents for the use of Alternating Current were bought by George Westinghouse who, with Stanley, developed the transformer, opening the way for high voltage power transmission.

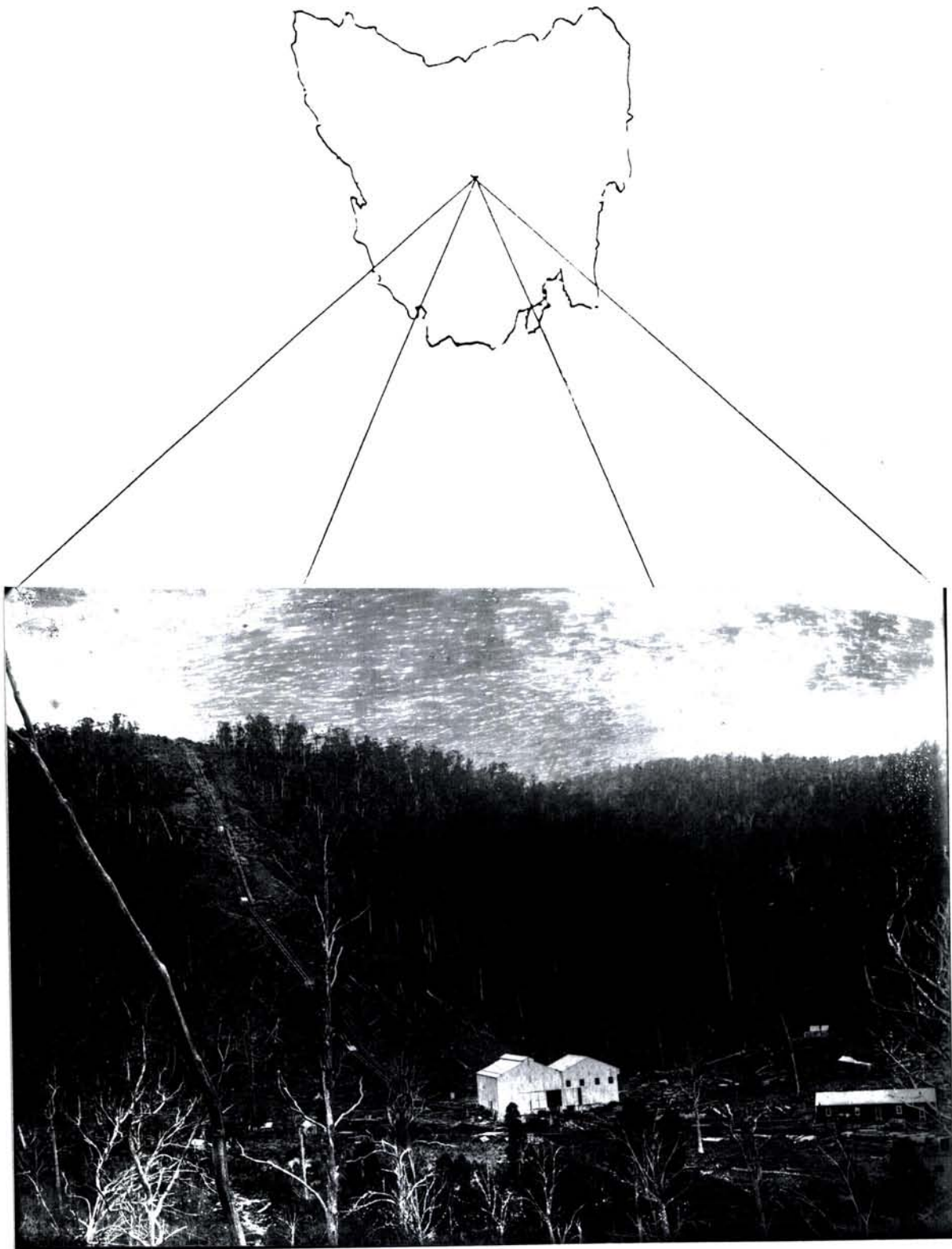
Westinghouse also bought the patents established by Tesla in 1888 for a system of polyphase motors and demonstrated a two phase AC motor in 1893.

In 1893 the International Niagara Commission selected A.C. transmission to carry power from a large scale hydro-electric development at Niagara Falls to Buffalo, a distance of twenty two miles. By 1899 a 40 kV seventy mile transmission line was opened in California.

Wooden poles and cross arms were satisfactory for transmission voltages up to about 66 kV but as these voltages began to be exceeded about 1901 serious arcing phenomena were encountered which destroyed poles. The development of steel transmission lines towers in 1905 and, more importantly, suspension type insulators (rather than the pin type) in 1907 made practical the consideration of higher transmission voltages.

Due to these factors it can be said that the development of Great Lake hydro-electric power for use in Hobart would have been impossible before 1895, risky before 1903 and uneconomic before 1907. The development of high voltage alternating current transmission technology changed the whole nature of electricity supply in Tasmania. The quantum leap from Lake Margaret's 6.6 kV transmission line to Waddamana's 88 kV 65 mile transmission line shaped the future in a way no development, before or since, has done. It paved the way for a state wide system and eventually the Hydro Electric Commission.

LOCATION



1919

HISTORY

The basic background to the development was that certain complex zinc ores mined at Broken Hill could not be refined by existing methods. Tasmanian West Coast ores were similar. J.H.Gillies developed an improved process for the electrolytic deposition of metallic zinc and had built and successfully operated a pilot plant at Richmond in Victoria. The process used a large amount of electrical power. The large shareholders of the Gillies Sulphide Concentrating Company then formed themselves into another company, Complex Ores, and started looking for cheap electrical power.

Gillies came to Tasmania and after looking at the West Coast and finding no suitable sites was returning to Melbourne when he met the Premier of Tasmania, Sir John Evans, on the steamer. He convinced Gillies that he should meet Professor Alex MacAulay who was Professor of Physics and Mathematics at the University of Tasmania and used his summer house near the Great Lake as a base to explore the area and to conduct calculations in isolation. (His system of 5 figure logarithms was widely used till the advent of the computer and calculator.) He knew the area well and had written to the Hobart Mercury newspaper in 1905 outlining a power scheme utilising the water from the Great Lake. Mr. Brettingham-Moore, a civil engineer, read the letter and after visiting the area also became a proponent of the development of the Great Lake for power generation.

Having found a suitable site the company placed two proposals before the Government. The first proposed that the Government develop the scheme and supply power to the company. The second was that the company be given the right to do so. The Government declined to develop and passed the Complex Ores Act which empowered the taking and conserving of the waters of the Great Lake, the construction of works for the supply of electrical energy, and the construction of transmission lines. It also empowered the promoters to supply electrical energy to any local authority, including the Hobart and Launceston councils, and to any company or persons (outside a radius of 10 miles of the city of Launceston). This restriction was in accordance with previous government approval given the Launceston City Council when it proposed and developed the Duck Reach power station in 1895 to supply lighting in the city area.

The company floated a special company, the Hydro-Electric Power and Metallurgical Company, engaged Merz and MacLellan as their London consulting engineers and had a scheme designed. Merz and MacLellan were the worlds leading power designers at that time. In 1904 Charles Merz and William MacLellan presented to the Institution of Electrical Engineers a paper entitled "Power Station Design" which drew such interest that two further presentations were necessary. The paper became a classic on the subject.

The original concept entailed the installation of two 4050 KVA turbo-alternators and one 88 kV transmission line to Hobart. The civil works included a 15 feet high gravity dam on the Great Lake at Miena, the outfall of the Shannon river, at the Southern end of the lake. The water released followed the Shannon river for approximately five miles and was diverted into a canal of 300 cusecs capacity. The canal length was 3 1/2 miles and it supplied the Penstock lagoon, formed with levee banks around a natural depression. The elevation of the Penstock lagoon was 3014 feet giving a static head on the station of 1120 feet.



15 FEET HIGH DAM AT MIENA -- DOWNSTREAM FACE -- CIRCA 1912



15 FEET HIGH DAM AT MIENA--1916

Work started on the project in 1911. The winter of 1912 was the coldest on record, snow drifts blocked the wooden tramway making it impossible to haul supplies from Red Gate, frost and later ice formed on the rocks and pipeline making work impossible. The fast flowing river Ouse was frozen for about five or six feet out from the banks and ice covered vast areas of Great Lake. When it was not snowing or the biting wind creating a severe chill factor the rain came and turned the work and camp areas into quagmires. Work on the canal ceased and efforts were concentrated on finishing the dam and power house to be ready for the machinery which was eventually prevented from being delivered by the same severe conditions.

These conditions, coupled with the difficulty of raising further money, caused the construction to grind to a halt in 1913. The unstable world situation due to the Balkan wars made further finance raising impossible and in 1914 the company was in receivership.

The Government moved slowly and could have let the company go bankrupt but there were several good reasons why it should not.

1. Most of the difficult and expensive civil work was complete, the machinery manufactured and paid for, and the transmission towers were either in Hobart or waiting shipment
2. Mr. Parry, Engineer in Charge of the New Zealand Hydro-Electric Department, reported that the scheme was well designed and constructed.
3. There were two certain big customers in Hobart and one probable big customer.
4. The presence of J.H. Butters who was the driving force of the scheme and whose ability to continue was unquestioned.

The Government purchased the Great Lake scheme in October 1914 with all rights and equipment.

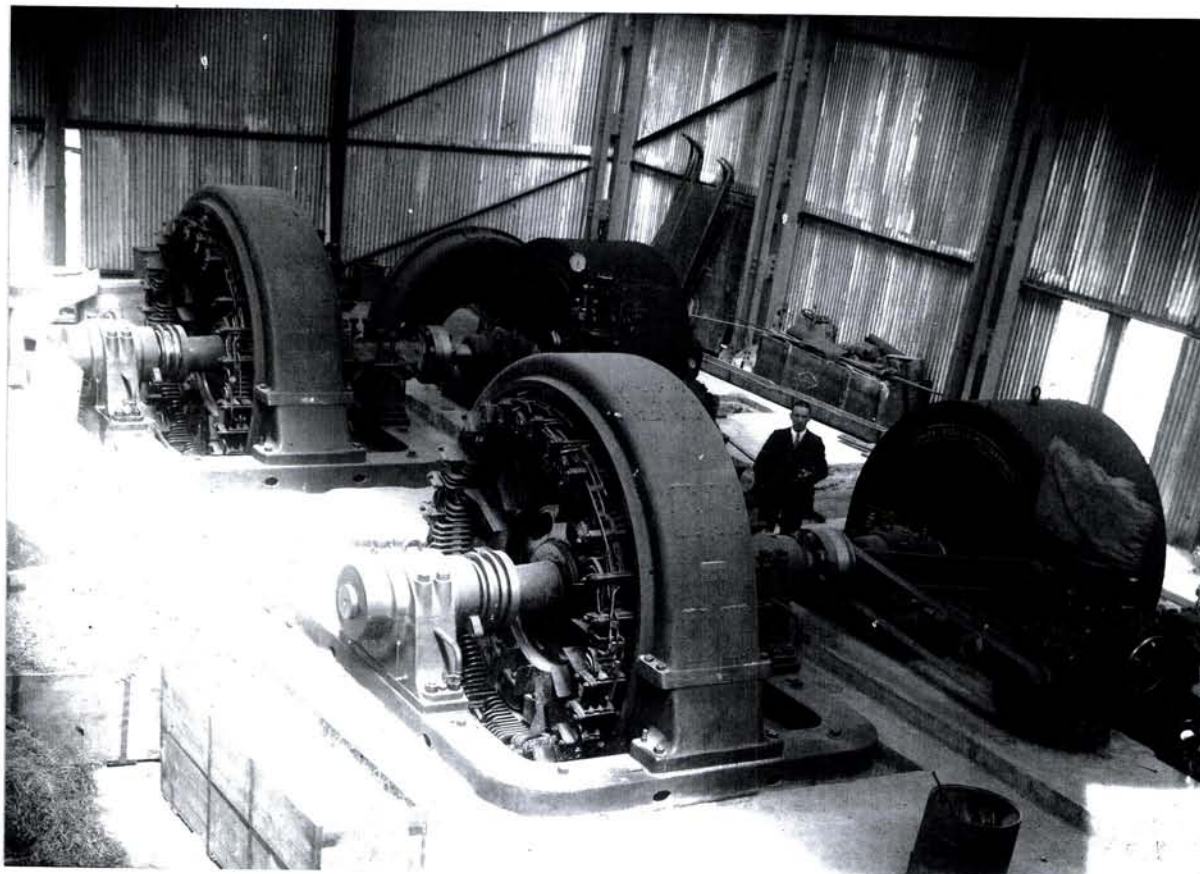
J.H. Butters continued as Engineer in Chief of the newly formed Hydro Electric Department, completed the original stage, organised the Department in a manner which saw it through many years and supervised two expansions of the power generating capacity.

ORIGINAL INSTALLATION

The original installation was;

2- 4050 KVA 0.85 PF 6.6 kV 375 RPM British Westinghouse alternators.

2 Boving single jet Pelton turbines.



FIRST TWO MACHINES -- 1915

The excitation was from a 110 volt bus supplied by 2 110 volt 1200 amp British Westinghouse generators driven by Boving single jet turbines.

The main turbine inlet valves were hydraulically operated vertical gate valves. The turbines were supplied from a 30 inch diameter bus pipe outside the station with a manually operated section valve between the offtake points. The two pipelines each had valves which were manually operated with high and low gearing and by-pass valves.

The water from the Penstock lagoon passed through a 48 inch diameter butterfly valve to a 48 inch diameter wood stave pipeline 3500 feet long, a bifurcation piece fed two steel pipes with a 38 inch gate valve on each. The pipes were 4300 feet long and were constructed in 5 metre lengths using the Boving Patent Muff joints. Their diameter varied from 38 inch at the top to 30 inch at the station.

The exciter turbines were supplied from a 12 inch bus pipe which could be supplied from either 30 inch pipeline.

The first extension in 1919 was a 7050 KVA 6.6 kV 0.85 PF 375 RPM General Electric alternator with a two jet Boving turbine. The turbine inlet valve was a Boving sliding valve.

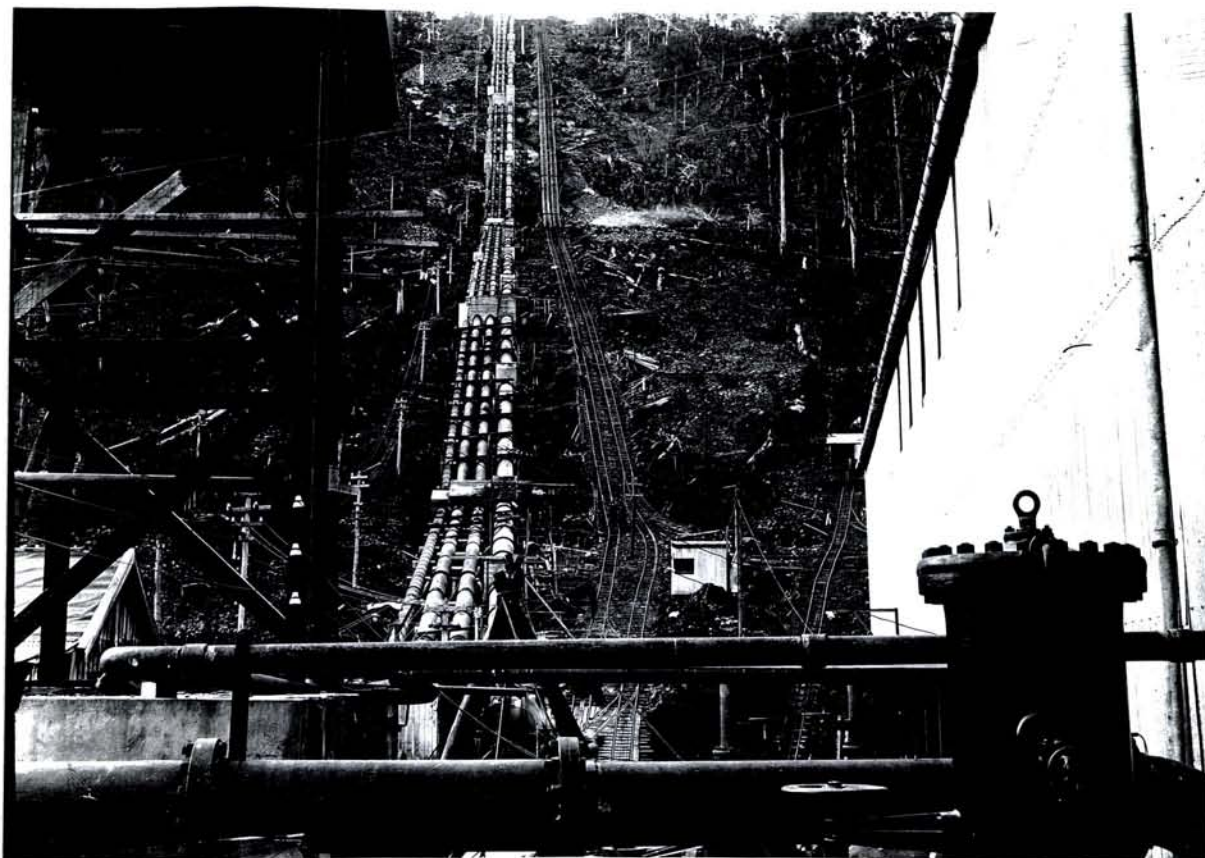
The external bus pipe was extended via a hydraulically operated isolating valve but no pipeline was added at that stage.

The later addition by 1922 had a further 6 - 7050 KVA machines, inlet valves, pipeline and section valves as for

No.3 unit but with the bus pipe diameter increased to 36 inch. A further 3 wood stave low pressure pipes and 5 steel high pressure pipes were added.



WOOD STAVE LOW PRESSURE PIPES --CIRCA 1922



VALVE PLATFORM AND HILLSIDE PIPES -- CIRCA 1920

It was necessary to increase the canal capacity to 600 cusecs while the system continued operation. A parallel canal was excavated as cells adjacent to the original canal and the walls breached. Two areas of rock, removal of which may have caused blockages, were bypassed leaving islands in the canal.

The electrical 6.6 kV connections to the bus were through General Electric small oil volume circuit breakers. The 6.6/88 kV Westinghouse transformers had 88 kV manually operated single phase links as did the transmission line breakers, which were Westinghouse OCBs with solenoid operated action.

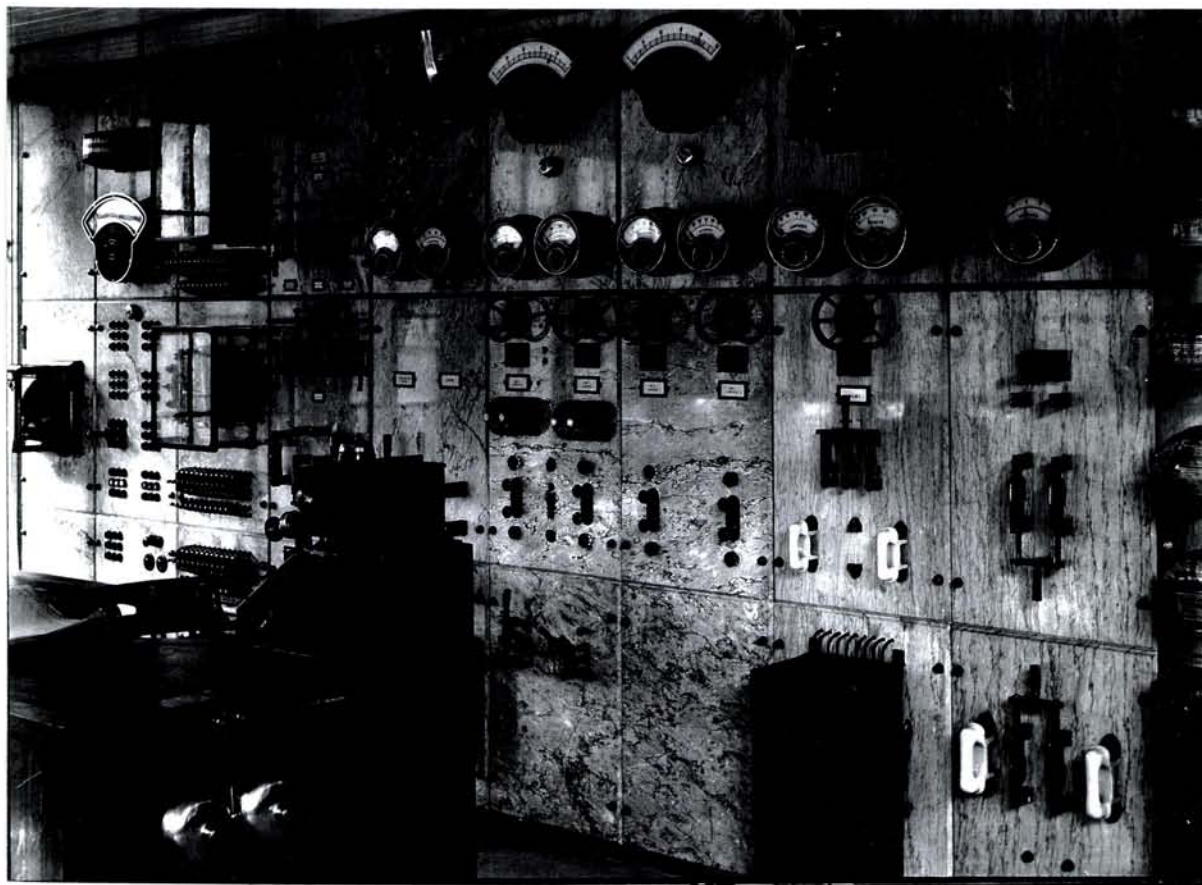
In the final configuration the 6.6 kV bus was divided into 3 sections with section OCBs and the 88 kV transmission lines all had Westinghouse 88 kV OCBs as in the original installation.

88kV electrolytic lightning arrestors were placed at each end of the switchyard. These required daily charging by connecting them to the 88 kV bus to maintain the oxide film on the aluminium electrodes.



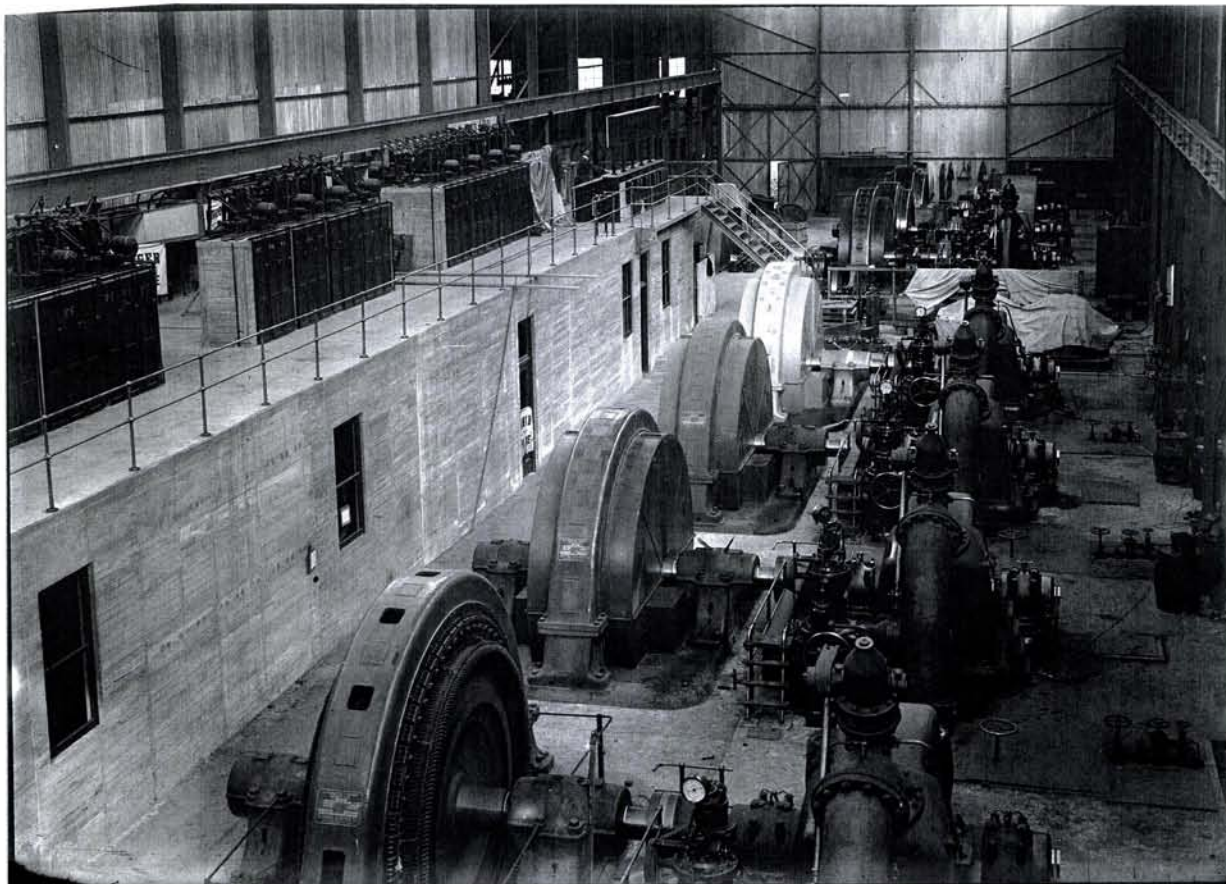
SWITCHYARD --1922

The bench board controls were General Electric and set in 2 inch thick marble panels as were the vertically mounted GE meters.



D.C. EXCITATION PANELS - CONTROL ROOM

The increase in the number of machines in the final extension required greater excitation current and 2 motor driven 300 KVA generator sets with Bruce Peebles motors and General Electric generators were installed. The motors were 6.6 kV, supplied from the bus bars. These were replaced in the late 1940s by 2 Boving pelton turbines driving 300 KVA General Electric generators. The motor generator sets have been returned to the station as part of the museum display.



STATION INTERIOR FROM No 9 MACHINE END -- CIRCA 1922

The increase in storage capacity necessitated by the increase in station and canal capacity was provided by the replacement of the 15 feet high gravity dam at the Great Lake by a 40 feet high, 1180 feet long dam constructed in 27 arches. This was of most advanced design and was extremely successful. The dam is subject to considerable wave action being at the end of a 17 mile long stretch of water on a 3500 feet high plateau with few protective hills.

Much of the material for the dam was transported the length of the lake by water after being carried by road from the north of the State.

LIAWENEE CANAL

Coincident with the raising of the Great Lake level by 1922 a 650 cusec canal was constructed to divert the Ouse River to the Great Lake. This Liawenee canal is 5 1/2 miles long, with a number of deep cuttings through dolerite and has a one mile long concrete flume section. The whole area is at an elevation above 3500 feet with the consequent severe working conditions.

Under high river flow conditions the Liawenee canal flow is limited to normal canal capacity by an ingenious static device designed by the Department's Hydraulics Engineer, E.F.Rowntree. The simple device is a curved plate which spans the canal and has a designed orifice in it whereby excess head on the plate causes water to spill through the orifice and create proportional turbulence behind the plate and so limit the flow under it. This device is still in operation.

SHANNON POWER STATION

The water released from the Great Lake followed the Shannon river for approximately 5 miles before entering the canal to the waddamana Penstock lagoon and the latter part of the river had a steep fall. After Waddamana station was completed this fall was developed by forming a lagoon with levee banks, building a 2 1/2 mile long 600 cusec canal and installing two 5 MW Francis turbine generating sets operating on a 258 feet head. The equipment was all English Electric and the station was commissioned in 1931. However one turbine casing failed

in 1933, flooding the station. After replacement and repair the station was recommissioned and gave no further trouble until decommissioned in June 1964.

WADDMANA "B" STATION

The water from Great Lake was further developed by the construction of a separate 48 MW station denoted "B" station immediately adjacent to the original (now "A") station with both being controlled from the original control room which was extended. A further canal of 700 cusec capacity was constructed and the project, commenced in 1941 was completed with the commissioning of the fourth 12 MW machine in 1949.

While the stations were virtually operated as one entity, because of the different transmission voltages, 88 and 110 kV, they were electrically connected some 65 miles away, in Hobart, where the two transmission systems met.

A later development at Waddamana, in the 1950s, of a large switchyard created a transmission hub at almost the geographical centre of the State with lines radiating North, South and West and also interconnecting the two power stations.

The commissioning of Poatina station (1963-64) at the North end of the Great Lake utilising a head of 2720 feet caused the closure of Waddamana "A" and the relegation of "B" station to utilisation of runoff water and supply of riparian water for farmers downstream. The interconnecting switchyard remains in service.

WADDAMANA 'A' CLOSURE

Waddamana "A" station was officially removed from service on 30-6-1965. Due to its importance in the history of the State and the Hydro Electric Commission proposals were made to make it a museum. These were accepted and the Waddamana Power Museum was opened by the then State Premier on 6th May 1988, 72 years after the commissioning day and in the Bicentennial year.

The building, generating machinery and ancilliary equipment remain essentially as originally installed and in good condition.



WADDAMANA POWER MUSEUM -- 1988

LEGACY

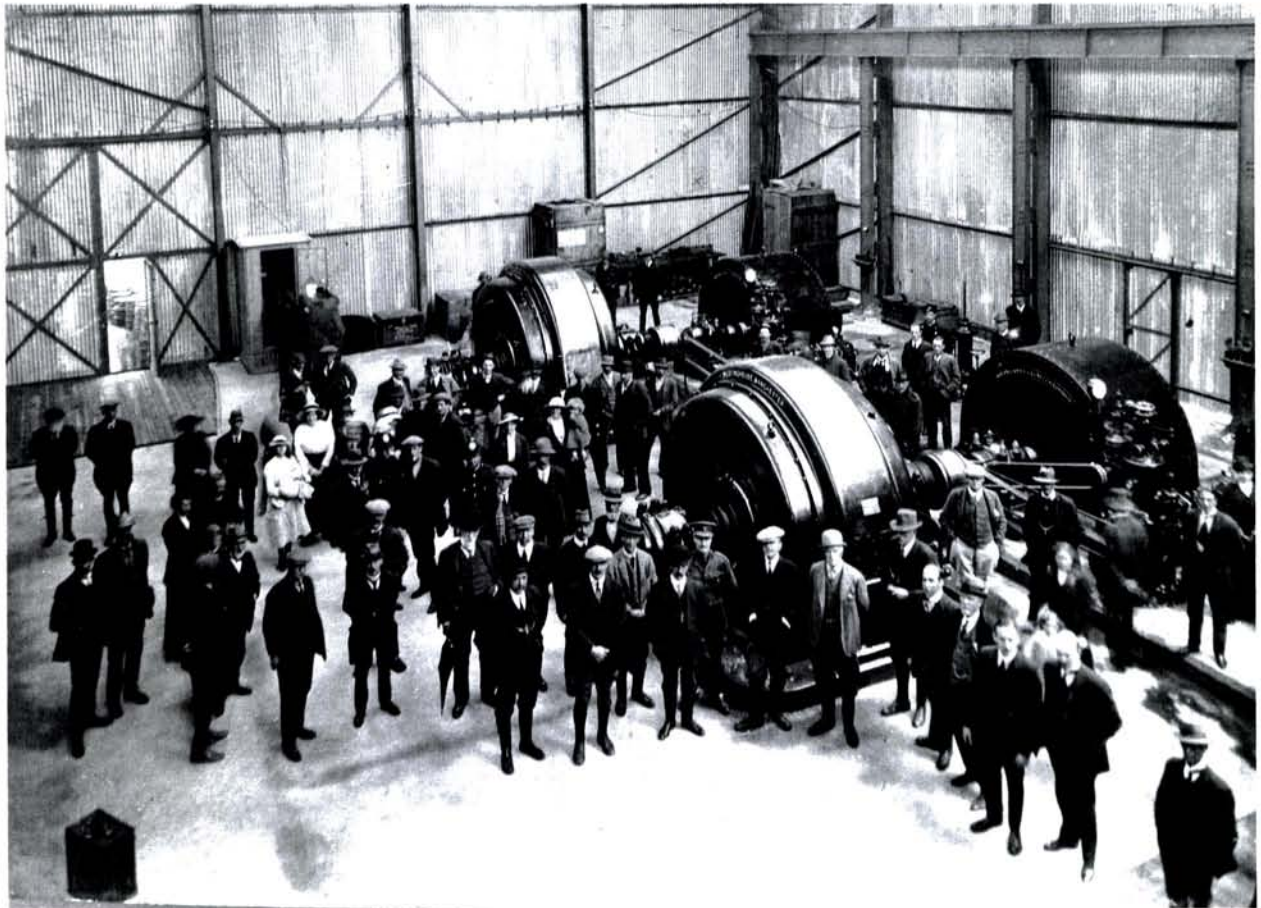
The generation, transmission and distribution system proposed in 1908, originated in 1911 and commissioned in 1916 has grown to a system with a present (1993) installed capacity of 2460 MW consisting of 26 hydro stations and one oil fired thermal station. The transmission system has 1372 km of 220 kV, 1917 km of 110 kV and 149 km of 88 kV transmission lines, major industrial load totals 615 MW and domestic customers number 183000.

The Hydro Electric Department/Commission had had a many faceted effect on the Tasmanian community by developing towns for its own purposes, opening large areas to tourism, creating lakes which are used for recreation and providing roads which would not otherwise exist.

In the period immediately after world war two there were usually two schemes being developed concurrently and the work force absorbed great numbers of European migrants, many non English speaking and exservicemen. These people in general remained and have had a great broadening effect on the Tasmanian island society.



POWER MUSEUM OPENING -- 6TH MAY 1988



POWER STATION OPENING -- 6TH MAY 1916

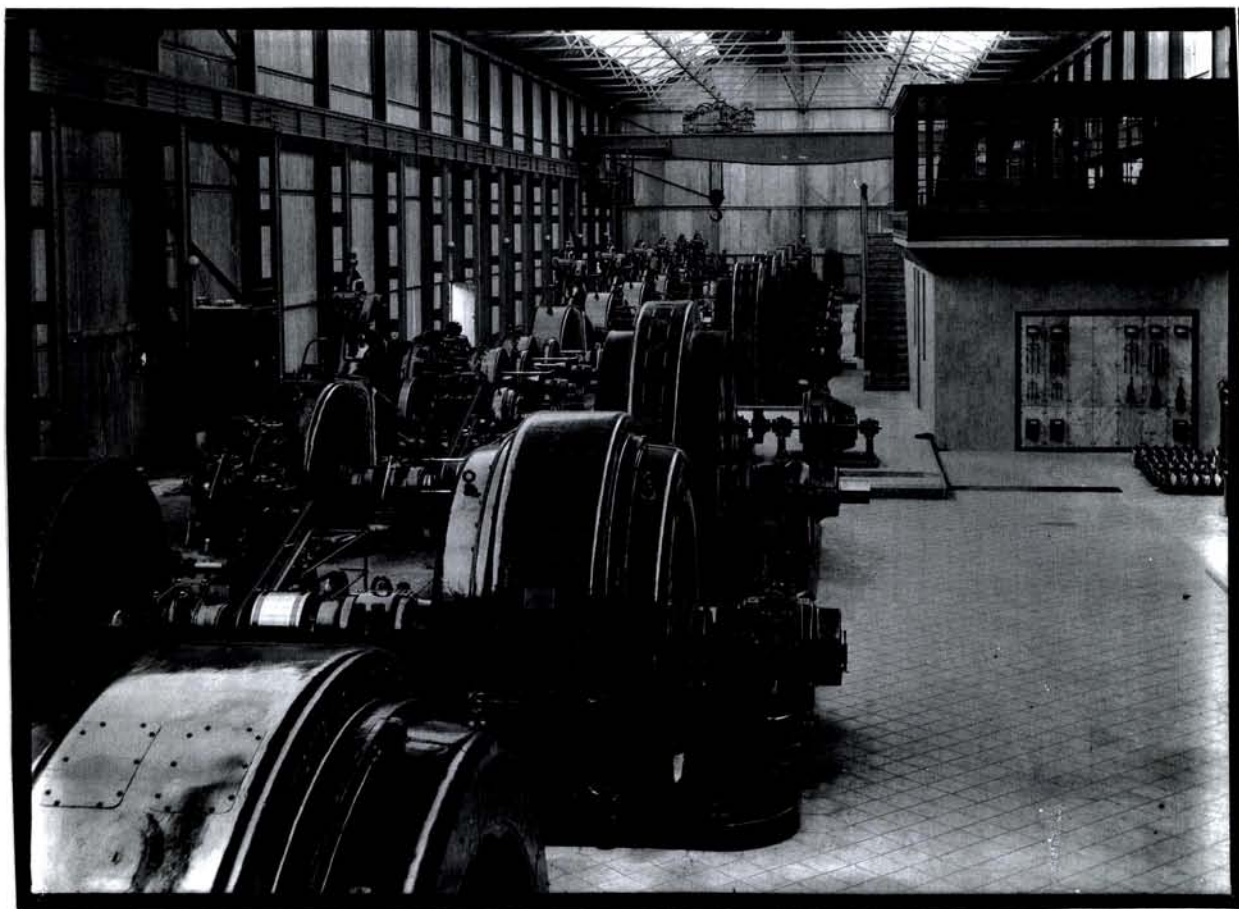
JUSTIFICATION

1. The station is the power source of the first complete public hydro electricity supply system in Australia.
(Storage-generation-EHT transmission-local distribution)
2. Transformers, steel towers and suspension insulators had not long been available to make long distance high voltage electrical power transmission possible.



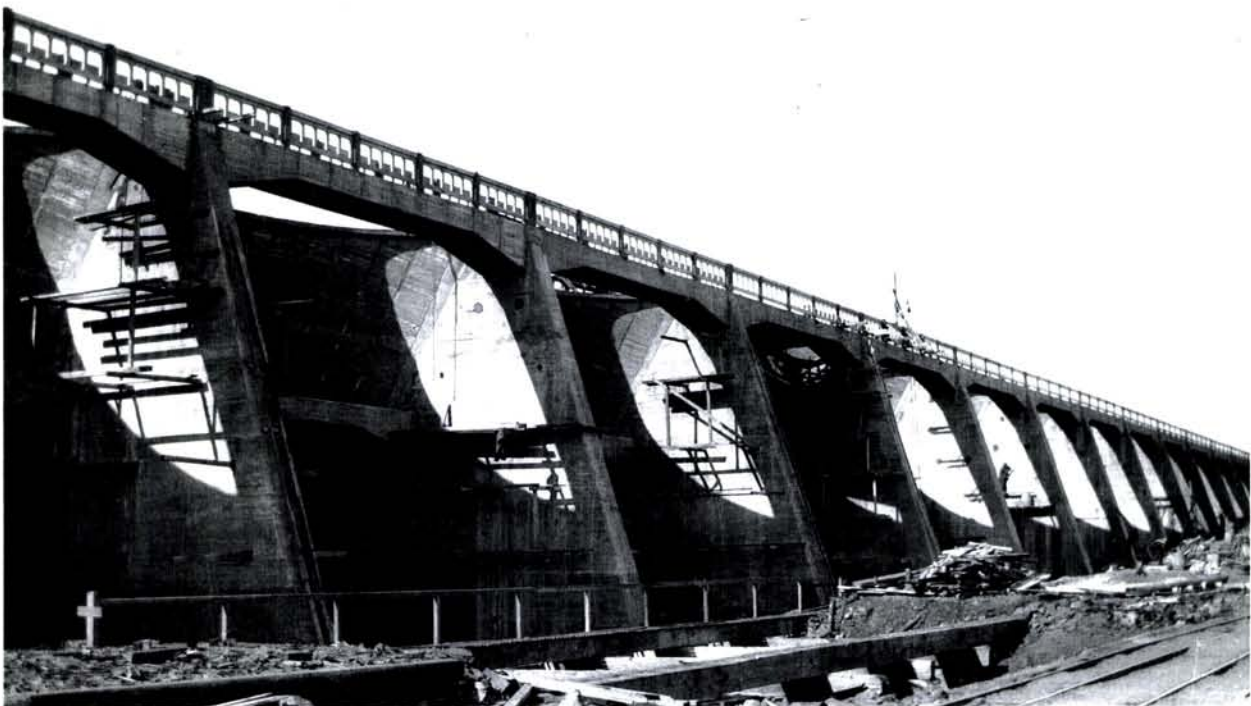
SWITCHYARD AND STATION ENTRANCE -- CIRCA 1922

3. The scheme was originated by a meeting of Professor Alex MacAulay of the University of Tasmania and Mr.J.H.Gillies. MacAulay was Professor of Physics, was familiar with the Great Lake and the rivers to the South of it and had written to the Hobart Mercury newspaper in 1905 outlining the merits of such a scheme. Gillies was a metallurgist who had developed an ore reduction process which required large amounts of cheap electrical power.
4. The scheme is a monument to John H (later Sir John) Butters who as Chief Engineer constructed, redesigned and managed it. He left the organisation in Tasmania in 1924 to chair the Federal Capital Commission in Canberra.



STATION INTERIOR -- CIRCA 1922

5. The station (and headworks) were enlarged after commissioning of two units in 1916, one unit being added in 1919 and a further six by 1922.
6. The original two turbo-alternators and transformers were British Westinghouse, the 7 additional units were General Electric from USA because of post war difficulties of supply and transport from U.K.
7. The new dam at Miena (Great Lake) required for the increased station capacity was of very advanced design, of minimum mass, being of 27 thin walled arches 40 feet high and a total length of 1180 feet.



40 FEET HIGH MULTIPLE ARCH DAM AT MIENA
DOWNSTREAM FACE -- CIRCA 1920

8. The original construction of the power station required the design, construction and operation of a 17 mile long, wooden railed tramway from the Bothwell- Great Lake road to Waddamana, incorporating 4 bridges. All power station equipment, including pipelines and valves, came over that horse drawn tramway, the largest single item (generator stator halves) being 7 tons.



WOODEN TRAM TRACK

WORDING OF ORIGINAL TABLET ERECTED ON SITE

GOVERNMENT OF TASMANIA

THIS TABLET COMMEMORATES THE STARTING UP OF THE TURBINES
 BY HIS EXCELLENCY THE GOVERNOR GENERAL OF AUSTRALIA
 THE RIGHT HONOURABLE

SIR RONALD CRAUFURD MUNRO-FERGUSON PC GCMC

MAY 6TH 1916

THESE WORKS WERE COMMENCED IN 1911 BY THE HYDRO ELECTRIC PWR & METALS CO

J.H.GILLES ESQ MANAGING DIRECTOR

J.H.BUTTERS ESQ ENGR IN CHIEF. W.Mc.K.JEFFREY ESQ RESIDENT ENGR
 RESUMED BY THE GOVT OF TAS IN 1914 DURING MINISTRY OF THE HON J.EARLE

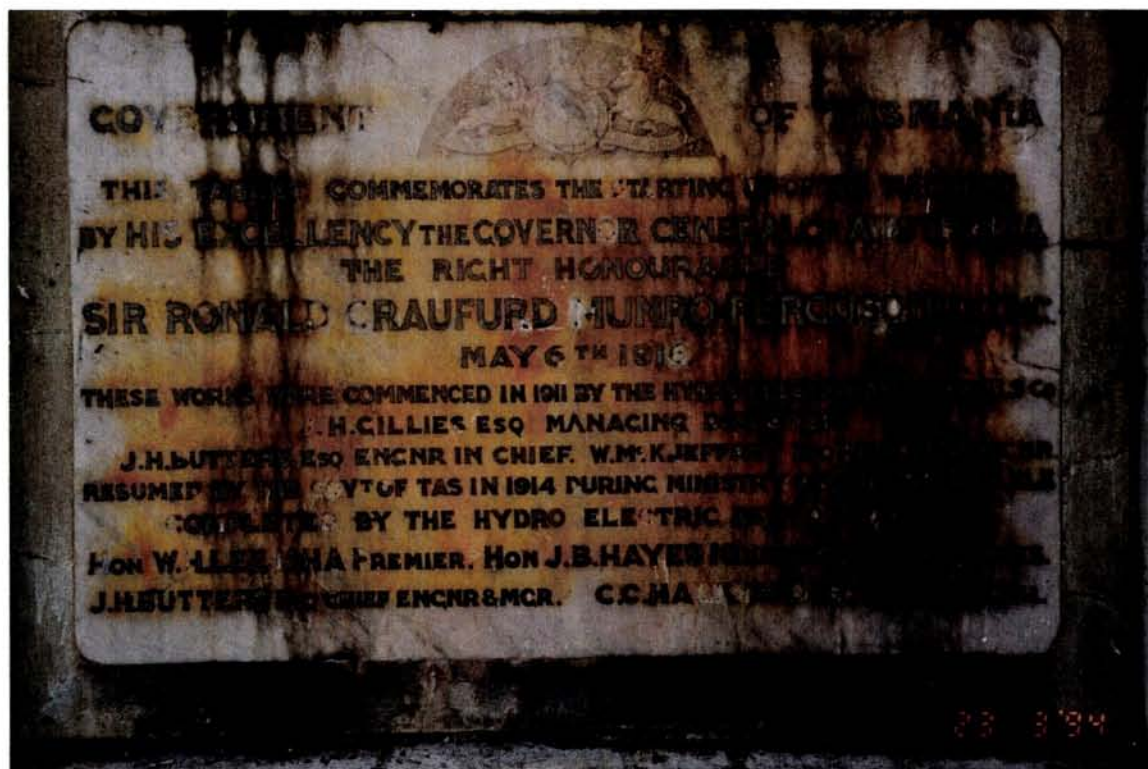
COMPLETED BY THE HYDRO ELECTRIC DEPT OF TASMANIA

HON W.A.LEE MHA PREMIER

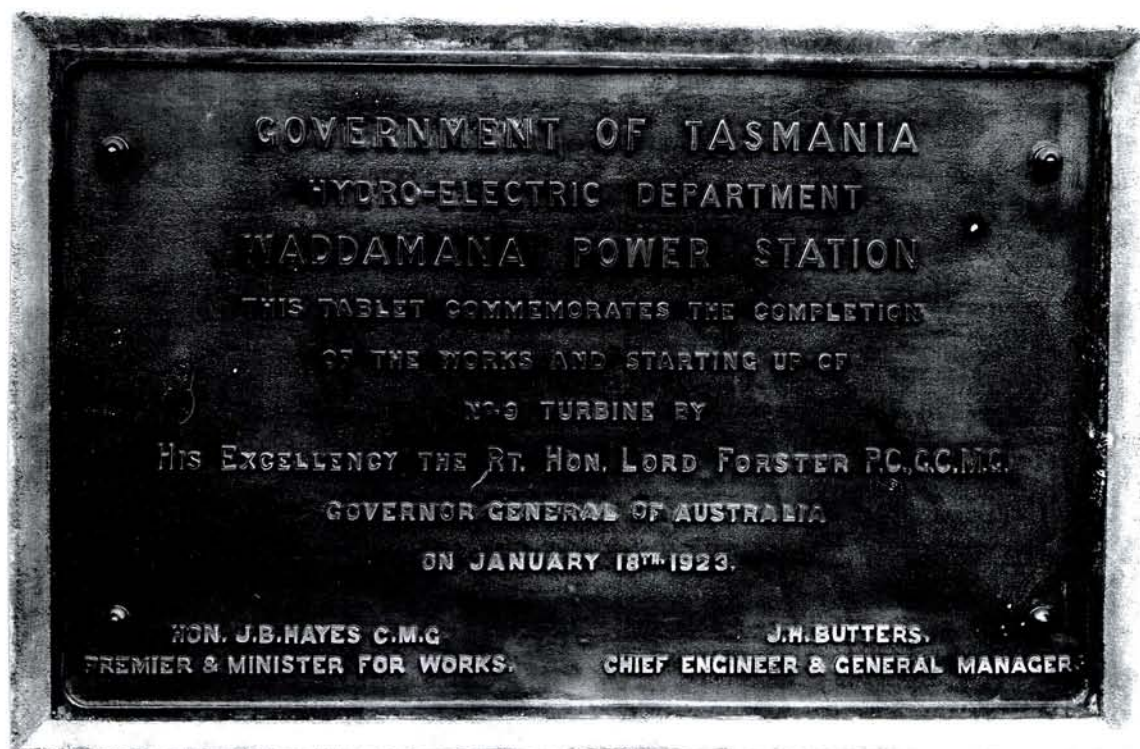
HON J.B.HAYES MINISTER OF LANDS & WORKS

J.H.BUTTERS ESQ CHIEF ENGR & MGR

C.C.HALKYARD ESQ RESD ENGR



TABLET LEFT HAND SIDE OF MAIN ENTRANCE commemorates completion of works and starting-up of No 9 turbine by H. E. Lord Forster, Governor General, January 18th, 1923



TABLET RIGHT HAND SIDE OF MAIN ENTRANCE

Waddamana Power Station

Continuous Full Load Capacity 66,000 HP

The following Engineers were engaged upon the works

HYDRAULICS

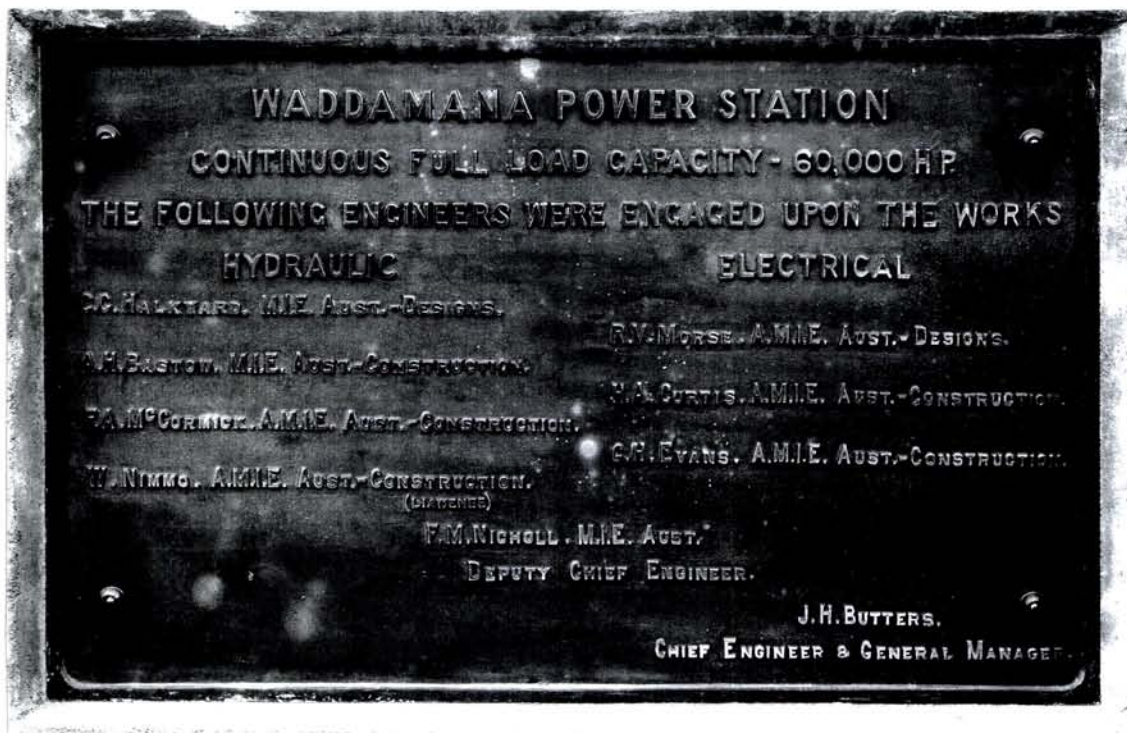
C.C.Halkyard	M.I.E.Aust	Designs
A.H.Bastow	M.I.E.Aust	Construction
F.A.McCormick	A.M.I.E.Aust	Construction
W.Nimmo	A.M.I.E.Aust	Construction (Liawenee)

ELECTRICAL

R V Morse	A.M.I.E.Aust	Designs
H.A.Curtis	A.M.I.E.Aust	Construction
G.H.Evans	A.M.I.E.Aust	Construction

F.M.Nicol M.I.E. Deputy Chief Engineer

J.H.Butters Chief Engineer and General Manager





POWER MUSEUM -- FRONT ENTRANCE -- 1994

PROPOSED PLAQUE WORDING

The Waddamana "A" power development was the first public Hydro-electric scheme in Australia. Commenced in 1911, the first stage of 7 MW capacity began service in 1916 with enlargement to 49 MW completed in 1923. This Hydro-electric scheme of international significance was a major engineering achievement of Sir John Butters C.M.G., M.B.E., F.I.E. Aust. It harnessed the natural resources of the Great Lake for community benefit and stimulated industrial development in Tasmania. The power station was closed in 1965.

Commemorative Plaque Nomination Form

To:
Commemorative Plaque Sub-Committee
The Institution of Engineers, Australia
11 National Circuit
BARTON ACT 2600

Date: 7-4-94

From: Chairman

Engineering Heritage Committee

Tasmania Division

(Nominating Division or Branch)

The following work is nominated for an *Historic Engineering Marker/National Engineering Landmark award:

Name of work Waddamana "A" Power Station

Location, including address and map grid reference if a fixed work

Waddamana - Tasmania

Owner Hydro Electric Commission, Tas

In support of the nomination the following information is provided:

For an Historic Engineering Marker (HEM)

(1) Proposed wording on HEM#

(2) Justification - please make data as complete as possible.#

For a National Engineering Landmark (NEL)

(1) Date of construction (or other significant dates).

1911 - 1923

(2) Names of key professional personnel associated with the work.#

J.H. Butters J.H. Gillies C.C. Halkyard

(3) Historic engineering significance of the work.#

Ref attached documentation

- (4) Comparable or similar works (a) in Australia (b) overseas.#
- (5) Features or characteristics setting the work above other engineering works.#
- (6) Contribution towards the development of engineering and/or the nation.#

For all Nominations

The following documentation is attached in support of the nomination:
(List all documents, photographs, etc, and enclose black and photographs).

Bound submission titled

Waddamana "A" Power Station Tasmania 1916-1965

The nomination has been discussed with the owner of the work who has indicated

.....
Approval for plaque (Copy of letter attached)

(Include statement regarding owner's attitude)

A copy of this submission has been sent to the Secretary of the

Division at

(For completion by a nominating body other than a Division)

In the event of this nomination being approved the nominating body will organise an suitable presentation/ unveiling ceremony.

K. C. Drewitt

K.C. Drewitt

(Chairman of Nominating Committee)

A. E. Freeman

(Secretary of Nominating Committee)

* Delete as appropriate

Where there is insufficient space, attach additional papers

Addendum to Submission for a N.E.L. Award

The Waddamana Power Station is the most significant monument to hydro-electric power engineering in Australia. It is firstly, as stated elsewhere, the power source of the first large, complete hydro-electric power supply system in Australia.

The generating machinery, exciters, auxiliaries, pipe lines, office and workshop buildings, which are all still in excellent condition, together make a 'time capsule' of the 1916-1923 period.

The layout of the station, bus-pipe arrangement, style of generator cooling, the corrugated-iron clad building, all as designed and constructed, are monuments to the engineering practices of the day.

It is the first major engineering achievement of John H Butters, who was one of the luminaries of the engineering profession in Australia in the 1920's, being the inaugural chairman of the Tasmania Division in 1920 and of the Canberra Division in 1924 and President of the Institution in 1928.

He was also Commissioner and Chief Executive of the National Capital Commission (1924-1929) and supervised the construction of Canberra leading to the opening of Parliament by the Duke of York in 1927. He was knighted during the ceremony.

Question 4.

(a) There were no comparable hydro-electric schemes in Australia at the time, apart from a number of small power stations for individual mining operations.

(b) The development of Waddamana followed the early development of Niagara Falls, USA, and was contemporaneous with European development.

It was only after the development of transmission line technology that hydro resources in areas remote from existing load centres became economic and in the European and American cases the stations developed were adjuncts to existing steam driven stations at the load sources.

The Great Lake scheme in Tasmania comprised a totally integrated system of which Waddamana Station is a representative part

Question 5.

The scheme demonstrates:

- (a) The vision of the originators
- (b) Correct use of 'state of the art' technology and equipment
- (c) Originality and determination of the construction force in the face of extremely difficult conditions of location, terrain, transport, and climate.
- (d) Halkyard's design of Miena Dam for minimum mass of concrete (because cement had to be imported from overseas) was the first outside the USA and the largest multiple arch dam then constructed.
- (e) The engineering, planning and organisational ability of John Butters was outstanding.

Question 6

These works:

- (a) Allowed the commencement of industrial development in Tasmania, which had hitherto been restricted to primary production for export revenue and furthered the development of the State as a whole, consequently raising the standard of living of the population.
- (b) Enabled large processing industries to be established, e.g. Electrolytic Zinc Co., Carbide Co., Cadbury's thus increasing opportunities for technical and other employment.
- (c) Developed a pool of hydro-electric engineering expertise which became recognised both in Australia and overseas and fostered the continued development of hydro-electric power resources in Tasmania for the next 75 years.
- (d) Marked the commencement of Tasmania as a training ground for those people working on schemes to be developed in other states. (e.g. Butters in Canberra, Nimmo in Queensland, Rowntree in Snowy mountains, Halkyard at Humes, and many others)
- (e) Stimulated the consequent reticulatin of electric power for urban and rural domestic and commercial purposes, which greatly extended the use of electric labour-saving devices and appliances.



**HYDRO-ELECTRIC
COMMISSION**

OUR REF.
YOUR REF.
ASK FOR

POSTAL ADDRESS
GPO BOX 355D
HOBART TASMANIA 7001

4-16 ELIZABETH STREET
HOBART TASMANIA 7000

TELEPHONE (002) 30 5111
TELEX: 58091
FAX: (002) 30 5823

5 October 1993

6 OCT 1993

Mr Keith Drewitt
Chairman
Engineering Heritage Committee
Tasmania Division Royal Engineers Building
2 Davey Street
HOBART TAS 7000

Dear Mr Drewitt

I am sorry that the Commission neglected to reply to your letter of 5 July 1993 and I thank you for writing a second letter seeking our agreement to recognise Waddamana as a National Engineering Landmark.

The Commission is delighted that the Institution of Engineers, Australia wishes to honour our first Power Station. I am pleased to accept your proposal and sincerely hope that the submission to the National Committee is approved.

If you receive approval from the National Committee, the Commission can arrange to have the plaque affixed to one of the pillars at the front of the Power Station.

Again, I apologise for the delay in replying to your request.

Yours sincerely

D.C. Jeffrey
Manager Public & Environmental Affairs

NOTES ON THE DEVELOPMENT OF THE POWER RESOURCES OF TASMANIA.

JOHN HENRY BUTTERS, C.M.G., M.B.E. (*Member*).

(*Read at Engineering Conference, Hobart, February, 1926.*)*

Having recently relinquished his position as Chief Engineer and General Manager of the Tasmanian Government Hydro-Electric Department, it seemed to the author that it might be advantageous, and certainly of general interest, to describe briefly the process of development which has taken place in regard to electricity supply in Tasmania during the last 13 years, during which period he has been the responsible engineer.

The experience of no two engineers or administrators will be the same, but on the other hand the experience of one will certainly help others, and the results which have been secured in Tasmania in the comparatively short time have been sufficient to make them of more than ordinary interest. Furthermore, a précis of this paper may serve as an introduction to a paper by some future member of this Institution on The Development of the $\frac{1}{2}$ millionth Horsepower in Tasmania a few years hence.

General Considerations in Early Years.

Towards the end of 1911 the author was appointed Engineer-in-Chief of the Hydro-Electric Power Company, which had just then been floated for the purpose of operating a concession which had been obtained from the Tasmanian Government to develop the water power of the Great Lake and River Ouse catchment areas and to supply power in Tasmania.

The primary object of the Company was to transmit power to Hobart for the purpose of extracting zinc from complex zinc ores, and the question of general electricity supply was a side issue.

The concession, which was granted by the Parliament of the State, confined the Company to the development of the

*Written in 1924 for presentation at 1925 Conference (postponed).

First Stage of Development.

As has been stated above, the first stage in the development of the power resources of Tasmania was the construction and completion of the first 10,000 H.P. at Waddamana, and the transmission of that power to Hobart in the South of Tasmania. Southern Tasmania had been selected by the original Company in view of the two excellent ports which were available, viz., Hobart Harbour, and North West Bay a little to the South,

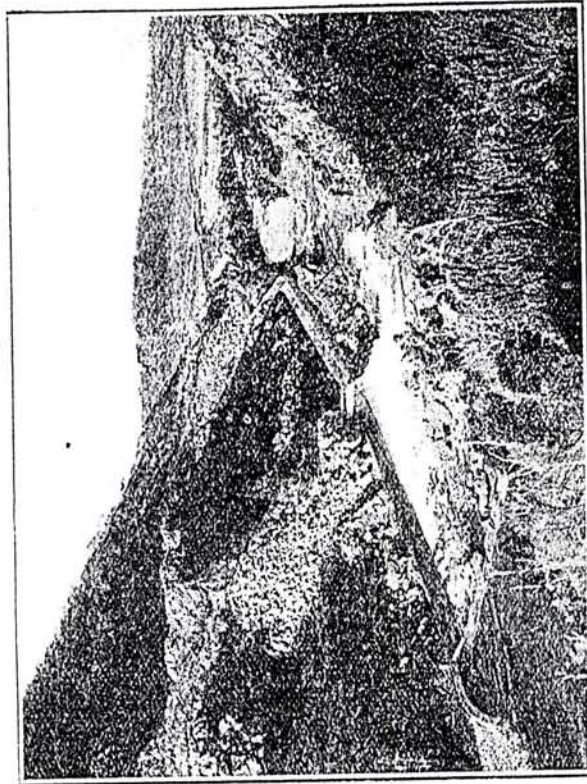


Fig. A.*—Ouse Diversion, Showing Diversion Weir and Concrete Flume, and Canal in distance.

such harbours being necessary for the carrying out of its original intention to import zinc ores and export the manufactured product.

Contracts were made for the street lighting of Hobart and suburbs, and a few small power contracts entered into, the idea being that the whole of the surplus would be absorbed in the electrolytic production of zinc.

* Figs. A.-D. illustrate a completed portion of Tasmania's power resources.

POWER RESOURCES OF TASMANIA—Butters.

catchments of the Great Lake and the River Ouse, that is to say, the catchment areas the upper parts of which have been developed during recent years in connection with the present Waddamana scheme.

On coming to Tasmania in August, 1911, the author found that practically nothing had been done in the direction of securing proper data in connection with either the power resources of the Great Lake and adjoining catchments, or for the whole of the rest of the State. Records running back about twenty years had been obtained at the southern end of the Great Lake, but on the other hand those which had been obtained during two or three isolated years at the northern end, showed a rainfall from two and a half to three times that at the South.

Some few years before, an attempt had been made to institute a hydro-metric survey, and a hydraulic engineer was engaged to commence the work. Unfortunately his engagement was short and his work was more or less confined to considerations of "potential" water power as distinct from economic water power, and in fact several of the sources reported upon are quite uneconomic and practically useless from the point of view of actual development. Parliament then viewed the subject with disfavour, and nothing further was done in regard to stream gauging or investigation for many years.

On the Company commencing work, gaugings were of course commenced at once in connection with the streams in which the Company was interested, and these have been continued from that day to this.

The Company continued to function until 1914 when the undertaking was taken over by the Tasmanian Government, and the Hydro-Electric Department of the State established, the author being appointed Chief Engineer and General Manager.

His responsibilities and interests were at once widened, and instead of being concerned merely in the development of the Great Lake and the River Ouse, it was obviously desirable and necessary to examine the whole question of the power resources of the State.

For the first two years from 1914 the whole of the energies of the Department were absorbed in the completion of the first stage of the Waddamana development, and it was not until May, 1916, that any serious thought could be given to the wider problem.

The original Hydro-Electric Company, however, decided to invest the money which it had at its disposal in a Carbide works at Electrona about 15 miles to the South of Hobart, but unfortunately it took a few years to bring these works to the point of operation owing to the difficulties of obtaining supplies under the existing war conditions.

The original Hydro-Electric works were then carried to completion and first brought into operation in May, 1916.

In the meantime consideration had been given to the whole question of policy under which the power scheme and the

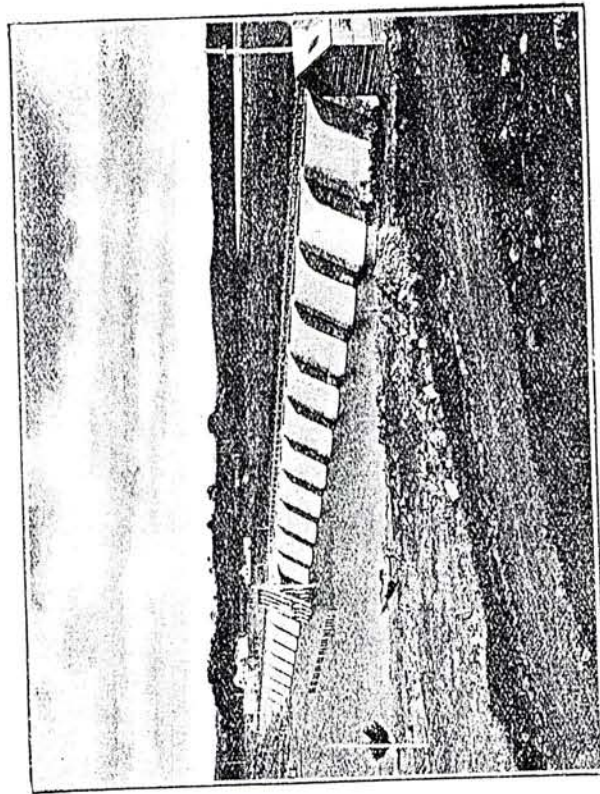


Fig. B.—The Great Lake Multiple Arch Dam.

eventual electrification of Tasmania was to be carried out. Here we had, as has been stated above, a power scheme which had 10,000 H.P. to sell, whilst the maximum demand on the station when the works were brought into operation was less than 2,500 H.P. The idea at the back of the mind of the Parliament of the day, when deciding to acquire and complete these works, was that cheap electric power should eventually be made available to every point in the State at which industry could be developed or stimulated.

The information which it was possible to secure in those early days justified the author in coming to the conclusion that over 100,000 H.P. could be developed from the catchments over which the Company had rights; subsequent investigation and more detailed surveys have indicated this total figure to be nearer 120,000 H.P. of maximum demand. Even in those early days the Company had definitely in mind the possibility of requiring to transmit to the South very large quantities of power for electro-metallurgical purposes. In considering, therefore, the transmission pressures to be adopted, this probability had to be taken into account.

As far back as 1910, when the author first became associated with the engineering work on this undertaking, transmission pressures of 66,000 or 88,000 volts were considered to be fairly high; probably the highest pressure in use in those days on a commercial scale was 110,000.

The whole problem was examined exhaustively and it was decided to adopt the pressure of 88,000 volts, it being borne in mind that Waddamana, the centre of distribution, was almost exactly in the geographical centre of the Island, that transmission routes in the future might amount to 75 miles or so for large quantities of power, over 100 miles for small quantities, and that a radius of 75 miles about Waddamana would practically encircle the whole of the State. This transmission line pressure involved the use of suspension type insulators.

The transmission line, which it was first intended to erect, was a single circuit line good for about 15,000 H.P., but it was subsequently decided, when the size of the original works was increased from 6,000 K.V.A. to 8,000 K.V.A., to make greater provision for the future by putting in double circuit transmission line towers with only one circuit erected for the time being.

After this expansion of the original proposals, it soon became evident that sufficient funds would not be available to complete the scheme, and although financial arrangements had almost reached finality for a new issue of debenture capital, the money market became seriously restricted, and the concession having almost expired, the works were purchased by the Government in October, 1914.

The Department on its establishment was thus faced with an undertaking in process of construction good for 10,000 H.P., but capable of expansion up to 100,000 H.P., commitments made in regard to the completion of the first stage of development, and the only revenue definitely in sight that which was obtainable from the sale of power in Hobart and suburbs.

A fundamental consideration throughout was the fact that the population of the State was small, no large industries of power importance existed, and the "bill" had to be backed by such as did exist.

With the backing and encouragement of the then Government, the author examined the whole situation and made enquiries and representations in many parts of the world, and finally came to the following conclusions :—

- (1) That cheap power, such as could be produced in Tasmania, would not of itself bring about the establishment of a large number of the ordinary kind of secondary industries which are associated with the industrial life of the cities of Australia.
- (2) That even supposing the first conclusion proved to be unduly pessimistic, the amount of power which the State could make available, would be able to supply all the secondary industries which would be likely to be operating in Australia probably for the next half century, and that the proportion of these which Tasmania might hope to get would be altogether too small to be important in the early stages.
- (3) That the only industries which we could feel certain of attracting to this State were industries requiring really large blocks of very cheap power; that is, industries whose power cost represented a big proportion of their total operating costs.
- (4) That the industrial future of Tasmania necessitated something really big being done in order to turn an unimportant electricity supply system into an undertaking of national importance.

These conclusions were accepted by the Government of the day, of which the Honourable John Earle was Premier, and shortly before the completion of the first stage of development the Government authorised the author to endeavour to establish contact with some of the bigger metal people, with the end in view mentioned above.

A combination of fortuitous circumstances developed just here in that the Amalgamated Zinc Company of Broken Hill, New South Wales, was considering the best method of dealing with the situation which had arisen in its business as a result of its principal purchaser of ore, viz., Germany, being cut off from the world's markets, combined with the national necessity for the production of electrolytic zinc within the Empire for

munition purposes. Negotiations were opened up with this Company which resulted in a contract being entered into to enable a trial to take place on a commercial scale, and giving the Company a short option on blocks of power totalling 30,000 H.P. to be exercised should the trial prove successful. The rates for the larger blocks were at the extremely low figure of £2 per horse-power per annum (plus a bonus contingent on profits) which was necessary to enable the industry to operate in Australia in competition in the world's markets at the then existing and contemplated market price for electrolytic zinc.

The first block of power, viz., 4,000 H.P., the Department was able to supply from its existing system, but it was considered desirable to instal a certain amount of additional spare equipment, and as a result another turbine was installed at the power station and a spare wire was erected on the transmission line, this additional wire being erected during operation on the towers carrying the first live circuit.

The experiment was a success, electrolytic zinc was produced on a commercial scale at Risdon, and the economics proved out in such a way as justified the expansion of the industry to its present great size, and to-day 33,500 H.P. is being used continuously day and night for this purpose.

Simultaneously with the above negotiations the question of the general electricity supply was taken in hand.

The existence of a completed power scheme with few consumers and a revenue from the sale of power and light in Hobart and suburbs of only £18,000 per annum in 1916, made it necessary to take active steps to stimulate the use of electricity for domestic and general purposes. On the Department coming into the possession of the monopoly of the sale of electricity in Hobart and suburbs, a new schedule of rates was devised reducing the price of electricity for lighting purposes from 6d. to 5d. per unit; for domestic power purposes from 2d. to 1d. per unit, for continuous hot-water systems from 2d. to ½d. per unit, and for ordinary small industrial power from about 2d. to 2½d. to a figure which varied from 1½d. per unit down to ½d. per unit. This had a remarkable effect in Hobart, in that the revenue very quickly commenced to soar in spite of the reductions, and it may be mentioned that in less than eight years it increased from £18,000 per annum to over £100,000 per annum, and the maximum demand from a little over 2,000 H.P. to over 7,000 H.P. To mention one item of domestic use only, there are now over 500 electrical hot-water systems in use in Hobart.

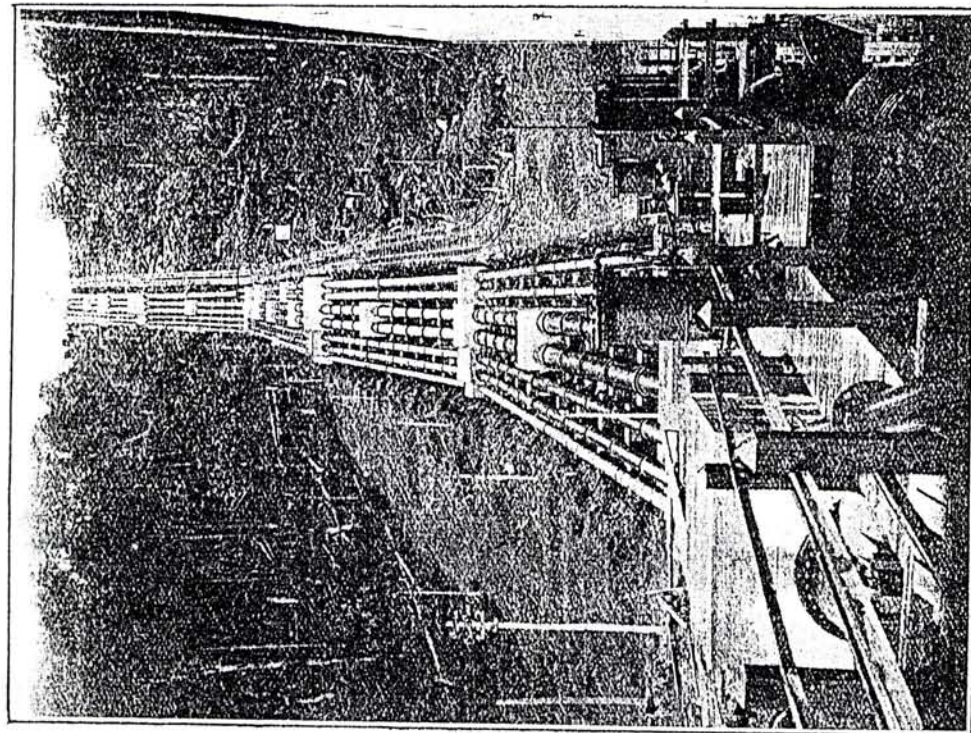


Fig. C.—Steel Pipe Lines, from Waddamana Power Station Platform.

At the time of entering into the contract with the Electrolytic Zinc Company, costs were of course very much less than they are now, but the author advised the Government that it would be possible to supply power under the Zinc Company's contract, supply power for general purposes in Hobart and suburbs at the rates mentioned above, and still balance the Department's ledger as soon as the works were fully loaded. Without deep and careful consideration and a large amount of optimism this was difficult to believe, but fortunately for the State it was believed and acted upon by the Governments and Parliaments, with the result that the undertaking has expanded year by year to its present position.

In addition to the Great Lake Scheme, there were other schemes in existence or in process of construction, namely the very interesting 6,000 H.P. development at Lake Margaret constructed by the Mount Lyell Company to meet the ever increasing cost of fuel in connection with its mining operations, and the small 1,500 H.P. hydro-electric installation of the Launceston Corporation which was, it is thought, the first hydro-electric works ever constructed in Australia. At that time no connection with the Hydro-Electric Department was contemplated by either of these undertakings, but the process of time has linked up the Launceston works with the Department's system, whilst the Department has contracted to purchase all the surplus capacity of the Lake Margaret development for the purpose of distribution and sale on the West Coast of Tasmania.

Second Stage of Development.

The exercising by the Electrolytic Zinc Company of its option over 30,000 H.P. in 1918, combined with the rapid growth of general business, made it necessary to commence without delay upon the extension of the power station at Waddamana, the construction of additional transmission lines to Hobart, the construction of a new substation at Risdon, and the general readjustments associated with such a large new load.

The power station was increased from 18,000 H.P. to 66,000 H.P. of turbine capacity, and all the headworks behind the power station were constructed in conformity therewith. This greatly increased capacity involved the construction of the Ouse-Great Lake diversion. From one circuit transmission line to the South it became necessary to put in three other circuits. It was considered desirable in putting in this additional transmission capacity to provide liberally for the future, and the capacity

of the southern transmission lines is now much in excess of the present developed power, and in fact will comfortably transmit 70,000 H.P. whenever required.

The Hobart substation was transferred from New Town to Risdon and brought up to a continuous capacity of 50,000 H.P. and it had combined with it a switching station to control the 15 mile transmission line to Electrona—the location of the Carbide Works.

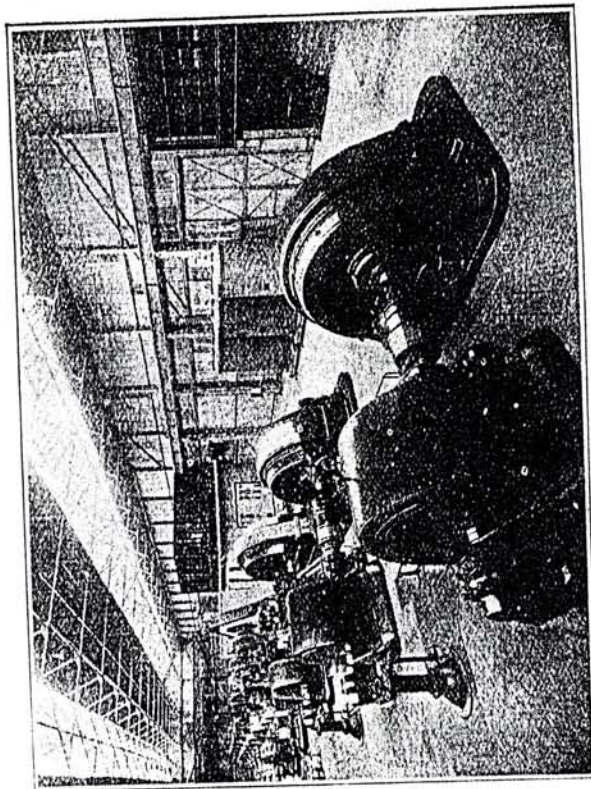


Fig. D.—Waddamana Power Station—Capacity 63,000 H.P.

Negotiations had been in train with the Launceston Corporation regarding a supply of power to that centre, and these were finalised at about this time, involving the construction of a transmission line from Waddamana across the central plateau to Launceston and the establishment of a stepdown station there, the initial amount of power involved being 3,000 H.P.

The whole of these works were completed in January, 1923, and this point in the history of the Hydro-Electric Department is usually referred to as the completion of the second stage of development.



Government of Tasmania

**HYDRO-ELECTRIC
DEPARTMENT**

. . THE . .

INAUGURAL CEREMONIES

In connection with the completion of

The Great Hydro-Electric Scheme

Will conclude on

Monday, the 8th of May

AT 8.15 P.M.

With a Monster

Public Meeting

At the

CITY HALL, Hobart.

. . When . .

. . His Excellency . .

The Governor-General of Australia

. . VIII . .

Connect through the Hydro-Electric

Power to the Hobart Distribution

System for the First Time

HIS EXCELLENCY THE GOVERNOR
OF TASMANIA

Will also Address the Meeting . . .

Other Speakers:

The Premier and the Leader of the Opposition

ISSN: 0013-7901

It is possible
to have a large
family group in
the same
house, but
you have to
be sure you
are strong
enough to
get that the
day, and to
be there.

"Singles" club
at Marling is
open... All
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get into it
because the
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"Budd" offered
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Fri Jun 19, 1916

The Mercury.

HOBART: MON., MAY 8, 1916.

OPENING A NEW EPOCH.

Either to-day or Saturday last may properly be termed a "red-letter day" for Tasmania, a day worthy to be marked, as the Golden Number used to be in the medieval calendars, with red lettering in sign of its very special importance; and if any good Tasmanian were asked Don Quixote's question, of whether the day should have a white stone for good luck or a black one for bad, he would certainly answer a white one. For on Saturday His Excellency the Governor-General started the manufacture, and to-night will admit Hobart to the use, of a wonderful fluid that is confidently expected to do very great things for the development, populating, and future prosperity of this State. Tasmania, from this day forward, is not going to be any longer a mere holiday ground, or the valley of the Derwent to be sneered at by the thoughtless as a Sleepy Hollow, or Hobart or any other city of this State to be jeered at as a place "where the soft go-easy grow and the put-it-offs abide." According to Kipling, Hobart, speaking as one of the Empire cities, says meekly,

Man's love first found me; man's hate made me hell.
For my babes' sake I cleaned those infamies!

Farmer for leave to live and labour well,
God hung me peace and rest.

But something more than peace and ease was hung. For Tasman, like little Benjamin, was given a certain golden cup; and that cup is placed right in the middle of this right little tight little island, just in the spot where its contents may be spilt to the best advantage; and from those contents that have been flowing away almost uselessly since Tasmania was first made, the hydraulic engineers have now extracted a natural force which, turned by the electricians into a current of power, constitutes for this State a potent dynamo—and one of which we are about to feel the benefit very particularly in Hobart. In short, Tasmania to-day comes into her blight, and the capital enjoys the first fruits.

The Governor-General goes so far as to express a belief that the Hydro-Electric power to be turned on to-night will open up a new era not only for Tasmania, but for the whole Commonwealth. We firmly believe it will, and there is some justification for so believing when we have His Excellency's opinion corroborated by Mr. Bowes Kelly, whose Company is so greatly concerned in making any such prophecies come true. The Chairman of the Mount Lyell Company predicts that "This is going to be the biggest thing industrially in Australia." That is a good deal to say, when we think of Broken Hill, Mount Lyell, Mount Morgan, and some other of the big things industrial of Australia. The Governor-General mentioned by way of comparison the exploiting of the coal resources of New South Wales. But as His Excellency mentioned, this Hydro-Electric development is, from its very nature, more lasting. What Mr. Bowes Kelly has in mind in predicting that the scheme now inaugurated is going to prove "the biggest thing industrially in Australia" is not the power itself, but what it will do, what developments it is capable of, and the fact that it is "here for all time." Men may come and men may go, but the little brook goes on for ever—even if somebody turns its current away. Mines may be found and mines may be worked out—"for 'tis their nature to"—but the current made from the little brooks that pour themselves into the Great Lake and down the Shannon and the Ouse may well go on for ever, providing we keep the pipe-line intact and the turbines and dynamos in good humour. Mr. Bowes Kelly simply reckons

POWER-HOUSE AND TURBINES.

The Waddamana power station stands with its back to a cliff, and in itself is not imposing. The building, however, is manifestly of the utmost importance by reason of its contents, so essential to the working of the hydro-electric scheme. Its roof protects an ordered assemblage of magnificent machinery, and conceals a wealth of engineering wonders. Prominent among the outstanding features are the turbines, which are operated by the water brought from the Great Lake, and directed latterly through branch piping to the turbines. The feeders are gradually reduced in diameter from three feet to seven inches, where the water leaves the nozzle of the piping to smash open the turbine, with a released velocity of 250 ft. per second, or 170 miles an hour. The turbines of the Pelham wheel type, consist of a flywheel weighing 15 tons, encased in a steel housing. In the circumference of the wheel, are built 19 buckets, equally interspaced, and the velocity of the water impinging on them causes them to rotate, as already mentioned, at a speed of 375 revolutions per minute. The water jet is governed by a needle valve which automatically controls its magnitude in proportion to the varying load, and in cases of emergency a deflector comes into play, and turns the stream of water away from the bucket-centres, allowing it to speed, for the most part unused, into the tail-race. This governor is of the oil pressure type, driven by bellows from the main shaft of the turbine itself. The original pair of turbines were of 5,000 horse-power, the remainder being each of 8,000 horse-power capacity.

GENERATION AND TRANSMISSION.

Side by side with each turbine is a generator, the office of which is to transform the mechanical energy created by water action into electrical energy. Seen with their protecting covers on, there is little to distinguish turbine from generator as they gallop in never-ending circle. Actually the generator consists of two main parts, the rotor (a flywheel of 18 tons) and the stator, heavier by a matter of another 9 tons. The total mass of turbine and generator as a complete unit turns the scale at 100 tons. Instead of buckets, the rotor of the generator carries on its circumference a series of electro magnets, excited by direct current supplied from separate turbine-driven generators. The stators are built up of thin sheets of steel, bolted together in cylindrical form, and provided with slots on the inner surface, in which are laid the generating coils of the machine. Just as the water racing downhill to the power-house is distributed to the turbines by means of a common "bus" pipe, so the resultant electric power flows to a central set of conductors. These distribute it to transformers outside the building, and in turn it is transmitted over conductors supported by steel structures placed at intervals en route to the Hobart sub-station, the pressure of 88,000 volts being there reduced, by means of other transformers, to 11,000 volts for the Electrolytic Zinc Works and to 6,000 volts for Hobart reticulation purposes, and the bulk supply to the Corporation (as recently described in special articles in "The Mercury" descriptive of the sub-station).

upon the Great Lake "remaining." Lugubrious pessimists have sometimes prophesied that it won't; but we do not expect the heavens to fall yet, just to spite our electricity supply. The particular Clerk of the Weather who attends to Tasmania's annual rainfall, assisted by the engineers who move brooks and rivers into new channels as required, may safely be relied upon to continue the endowment of Tasmania by filling with due regularity the golden cup. We can see to the test!

In the meantime we have something definite to "blow" and "boost" about, as those elegant phrases go, in the fact that the State possesses in actual working the largest Hydro-Electric undertaking south of the Line. What potentialities there may be in South America or elsewhere—there are great ones certainly in the Zambesi scheme of South Africa—remain to be proved; while our current is already at New Town, and, all being well, will be to-night in Hobart. It means much, and in many ways—so much that we may safely say no greater event has ever happened in the history of the State since it was discovered. Money, it is said, is power. Power is also money. Moreover, cheap power is the means of industry, of populating the State, of establishing here thousands of comfortable and prosperous homes, of turning to account the State's natural riches in a hundred different ways for the benefit of the people; in short, of making our little Tasmania permanently useful to the world. If those who make two ears of corn or two blades of grass grow where only one grew before do more essential service than, as Swift said, the whole race of politicians put together, those politicians and others who have helped to harness Nature to a work of infinitely greater consequence may also claim to deserve well of their fellow-countrymen. Happily in this instance those concerned may rightly say that "none were for a party but all were for the State," so that we may all shake hands and congratulate ourselves on the fruition of our labours—when that fruition arrives. For the present we have good ground for self-congratulation in the fact that the fruition now becomes possible. At very considerable expense the State has, as it were, unlocked its own natural treasury. But that expense is a trifle compared with the fine results that may reasonably be looked for as to follow from it. Mr. G. Brettingham-Moore, who was one of the promoters and directors of the original Hydro-Electric Company, declares that if that body had been able to raise the necessary capital to carry out its function, a million of money would not have purchased the scheme after a couple of years' working. In view of the large contracts for power already placed, this assertion seems by no means extravagant. The more reason, then, for satisfaction with the happy ending of the preliminary troubles by which so valuable and important a "public utility" of Tasmania reverts to the possession and the administration of the State itself. It remains for Tasmanians and their Governments to see that the power secured is well and wisely used, with such foresight as will lead to the use proving for ages to come not a curse to the State, as natural wealth sometimes proves, but a continuous blessing continually expanding, as undoubtedly it may.

THE HYDRO-ELECTRIC SCHEME

TASMANIA'S RED LETTER DAY.

OFFICIAL STARTING OF TURBINES.

OPENING OF NEW INDUSTRIAL ERA.

"THE BIGGEST THING IN AUSTRALIA."

(BY OUR SPECIAL REPORTER.)

Saturday, May 6, 1916, is a day which will be memorable in Tasmanian history as the date on which the Governor-General of the Commonwealth officially inaugurated the largest hydro-electric enterprise now on foot in the Southern Hemisphere. When His Majesty's representative in Australia turned the wheel and started up the turbines at the Waddamana power-station on Saturday, it was the outward and visible sign that the State was entering on a new era of industrial development, an era pregnant with possibilities whose magnitude but few people as yet realise. It begins with the development by the State of 10,000 horsepower by using a portion of the surplus waters of the Great Lake, but it will not end there. We are only developing about a quarter of the potential power of the Great Lake itself, and probably only about an eighth of what the Great Lake may be made to yield by diverting into it the head waters of the Ouse. And even to-day the demands and inquiries for power point to a time when the State will need to go further afield, and develop the reserves of power lying latent in the other lakes of the central tableland, and possibly other sources of water-power not yet thought of.

Such thoughts as these were in the minds of those who were privileged to be present at the remote and secluded spot at the bottom of the great gorge of the Ouse on Saturday when the ceremony of starting the turbines was performed. When I visited this spot less than five years ago it was an utter wilderness, hardly touched by the hand of man, and now it is the site of a power-station, from which is going forth an influence that is going to work more powerfully on the life of the State than anything yet has done. Saturday's ceremony was a symbol and a foreshadowing of great events to come.

It was but fitting that the day came bright and fine, with a clear sky and radiant sunshine. By a curious and happy coincidence it was the 50th anniversary of another great event in the industrial history of Australia, and one linked in many ways with the hydro-electric enterprise. On May 6, 1866, the first Broken Hill smelter was "blown-in," and amongst those present on Saturday was Mr. Bowes Kelly, chairman of directors of the Mount Lyell Company, who has been associated with Broken Hill from its earliest days. The Mount Lyell Company will be, as far as can be seen at present, the State's largest customer for hydro-electric power, and a most powerful factor in the success of the undertaking started on a day of such happy omen. Another link, an even more direct one, with Broken Hill is that the Amalgamated Zinc Co. proposes to take a great block of our power to treat zinc ores from Broken Hill.

The gathering at the power-station was larger than was anticipated, and thoroughly representative. Nearly 200 assembled to watch this epoch-making event, and they were drawn from all quarters of Tasmania and beyond. His Excellency the Governor-General represented the King and the Commonwealth, and His Excellency the State Governor the King and the State. The State Parliament was represented by four Ministers, the Premier (Hon. W. H. Lee), the Minister of Lands and Works (Hon. J. B. Hayes), the Treasurer (Sir Elliott Lewis), and the Honorary Minister (Hon. H. Hays), and also by the leader of the Opposition (Hon. John Earle). The Commonwealth Defence Department was represented by the State Commandant (Colonel W. J. Clark), and State departments by the Commissioner of Railways (Mr. G. W. Smith) and the Under-Secretary (Mr. D'Arcy Addison). Mr. Bowes Kelly represented the Mount Lyell Co., and Mr. J. H. Gillies the Hydro-Electric Co., which started the work, and carried it through its initial stages, and now intends to draw power

from it for developing important new industries. The country districts were represented by the Warden of Bothwell (Councillor N. J. Wise), in whose municipality the works lie, the Warden of the Norfolk (Hon. Ellis Dean, M.L.C.), the Warden of Green Ponds (Councillor E. O. Bisdoo), Mr. Harold Bisdoo, to whom came the first vision of the possibility of some such utilisation of the peculiar natural formation of this country, and many other visitors. And, though Hobart was not officially represented, quite a number of its citizens were on the spot, including Messrs. R. Nettlesfield, Davis, and Ribby. Naturally the staff of the Hydro-Electric Department turned out in force, including the chief engineer and manager (Mr. J. H. Butters), who has been in charge of the work from its inception, the resident engineer (Mr. C. C. Halkyard), the power station superintendent (Mr. H. A. Curtis), the transport superintendent (Mr. E. A. Bennison), who has had many local problems to wrestle with, and the surveyor (Mr. J. L. Butler). It may be mentioned that no fewer than nine motor-cars reached the power station, a good number considering that the road they had to use falls 1,300 ft. in three miles, and not built for motor traffic.

After a visit of inspection to the pipe line and a look round the power station, in the course of which he expressed himself as greatly struck with the natural advantages of the site, the useful use that had been made of them, and the great difficulties that had been overcome, in keeping with the chief engineer's motto: "Strenuus arduus cedant" (difficulties yield to the strenuous), His Excellency the Governor-General performed the opening ceremony. He said:

"Your Excellency, Ladies and Gentlemen.—The last time I was at a ceremony of this kind with Your Excellency was at the official opening of the Broken Hill Promoters' electric works at New-castle. It seems to me that to-day, as on that occasion, we are entering on a new phase in the history of industry in Australia. We have spent two days in looking over these works from the Great Lake downwards, and from every point of view I have seen much to admire. There has been no waste of money. The scheme seems to have originated in the minds of those living on the spot, and it has been handled with great courage and enterprise by those who took it up and decided to carry out this great undertaking. I think that the hydro-electric corporations, and the State have all great reason to congratulate themselves on the great work which has, as far as its first stage is concerned, reached completion to-day. (Cheers.) We have seen much in the last two days, and it almost seemed to me at the close of yesterday's proceedings that Providence itself had designed to bless the undertaking by the unexpected and copious recognition that it afforded upon us. (Laughter.) I believe and trust that this undertaking will open up a new era, not only for Tasmania, but for the whole Commonwealth, and that new industrial processes may arise, and that from the development of her water-power Tasmania may reap an advantage as great, and from its very nature more lasting, as New South Wales from the exploiting of her coal measures. I hope that both for Tasmania and for the Commonwealth this work will prove an object lesson as to the great advantage which can be gained from the harnessing of water-power, and that Tasmania will develop many flourishing industries, which will attract much additional skilled labour to this State, and provide much employment here, and so add to your State's population and prosperity. (Cheers.) Our minds are naturally occupied just now by the war, and our energies are devoted to the war and the problems arising out of it, but this undertaking is by no means alien to the great question of national defence and national safety, which takes up so much of our attention in this great crisis. It is well and fitting that this work has

been completed while the war is still raging. One lesson the war has taught, and is still teaching us, is that to render a great continent like Australia, with its vast but largely undeveloped natural resources, strong and safe, we must develop our industries and increase our population, and we must apply the highest possible science and skill to these ends, and to developing the resources and making the most of the advantages which nature has bestowed upon us. I hail this work as a great step in that direction. (Cheers.) I am very glad indeed that I have been invited by Your Excellency and the Government of Tasmania to set in motion the wheels of this magnificent enterprise, for which I predict a future greater than we can as yet realise. (Loud cheers.)

His Excellency the Governor-General then turned the wheel, and set the turbines in motion amidst loud cheers, called for by His Excellency the State Governor.

Later His Excellency the Governor-General unveiled a marble tablet on the front of the power-station, bearing the following inscription:—
This tablet commemorates the starting of the turbines by His Excellency the Governor-General of Australia, the Right Honourable Sir Ronald Crawford Munro Ferguson, P.C., G.C.M.G., May 6th, 1916.

These works were commenced in 1911 by the Hydro-Electric Power and Metallurgical Co., J. H. Gillies, Esq., managing director; J. H. Butters, Esq., Engineer-in-Chief; W. McK. Jeffrey, Esq., resident engineer.

They were resumed by the Government of Tasmania in 1914, during the Ministry of the Hon. John Earle, and completed by the Hydro-Electric Department of Tasmania. Hon. W. H. Lee, M.H.A., Premier; Hon. J. L. Hayes, M.H.A., Minister of Lands and Works; J. H. Butters, Esq., Chief Engineer and Manager; C. C. Halkyard, Esq., resident engineer.

THE RETURN TO THE CITY.

After the ceremony lunch was served at the residence of the power-station superintendent (Mr. H. A. Curtis). The party then took horse, mounted to the plateau again, and rode across it to the Shannon bridge, where the motor-cars awaited them. On the return trip to town a halt was made at the Melton Mowbray Hotel, where Mr. H. A. Curtis served an excellent dinner. The party was back about 10 o'clock, after a most enjoyable run.

ARRANGEMENTS FOR THE TRIP.

The trip was arranged by the Hydro-Electric Department, and the various details worked out well. Owing to the very nature of the expedition, the planning of the trip involved very careful elaboration.

Naturally a function like this was not made the success it was without the co-operation of very many hands. Some of those who rendered this co-operation in their several spheres have already been mentioned. Special mention must here be made of the power-station superintendent (Mr. H. A. Curtis), Mrs. Curtis, and the station staff, who did all in their power to make the visitors remember their stay at Waddamana with pleasure. Mrs. Macaulay to some extent relieved the pressure by most kindly and hospitably entertaining the press representatives (except one who climbed down to the power-station on Friday evening for business purposes, and was not game to face the road again in the darkness) at Ranna Leena, on the tableland above. The horses on which Their Excellencies were mounted were taken up from Hobart by Corporal Stanford and Trooper Harris, of the 12th Regiment depot. It may safely be said that everyone who made the trip enjoyed it thoroughly. Even those who met the one or two slight misadventures usually referred to in the account of the proceedings (and one or two others not mentioned) took them as part of the fun.

The State Commandant (Colonel Clark) very kindly placed at the disposal of the department for the trip half-a-dozen fine horses and military saddles and bridles. The horses were sent up in charge of Corporal Stanford and Trooper Harris.

The lunch served at Mrs. Collins's accommodation house at the Great Lake on Saturday was supplied by Mrs. Atkins, of the Grotto.

The commemorative tablets erected at the penstock chamber and at the power-house were the work of Messrs. Watson Bros., of Hobart.

THE DEPARTMENT'S TELEPHONE LINE.

An incidental reference has been made above to "The Mercury" representative's descent to the power-station on Friday evening. This was in quest of a telephone. The Postal Department has not yet seen fit to bring the facilities for telegraph and telephone communication any nearer to the Great Lake region than Bothwell, but the Hydro-Electric Department kindly made its special line from Waddamana to the New Town step-down station available. Mr. Curtis saw that the Waddamana end was all right, and Mr. McArthur opened the step-down station to the press, while Mr. Thomas was good enough to act as receiver and dictator. It must in fairness be said that it is a most excellent telephone line, not so to be beaten for clearness and distinctness. It was easier to send a message the 63 miles to New Town than it is sometimes to send one from Macquarie-street to Melbourne-street.

THE HEART OF THE SCHEME.

PIPE-LINE AND POWER-HOUSE.

The pipe-line which brings the water from the penstock-chamber to the turbines is a most important link in the chain of operations, and also a most difficult one to forge. Some idea of the position may be given by stating that the difference in level between the penstock-chamber and the turbines (1,300 feet) is just slightly less than that between the top of Mount Direction and the Derwent. The total length of the pipe-line is under two miles (9,500 feet, to be exact), so that the average grade is between 1 in 7 and 1 in 8. But, as a matter of fact, the grade is by no means uniform. The first part of the slope is a comparatively gentle incline, while the latter is particularly steep. The last 700 feet of vertical fall is almost precipitous. The country, apart from its steepness, is as rocky and rugged as the mere clearing and making ready of the pipe-line was a small matter. The use of wood pipes for the greater part of the way helped to lighten the task of transport, since this pipe was built up on the spot. But the steel pipe had, of course, to be brought up in sections, and the valve at the junction of the wood pipe and the steel pipe was a lift of 11 tons.

It should be remembered that all the material, whether for the power-station and its equipment or the pipe-line, had to be first hauled to Apsley, then carted six miles by road to the Red Gate, and then brought over a horse tram with wooden rails for 17 miles. Then, in addition, the pipe-line material had to be hauled up a cliff. This was accomplished by means of a haulage line up the steep slope at the bottom—a tramway upward.

The wood pipe, which winds along the pipe-track like a huge serpent, is built of Oregon pine—timbers bound together with innumerable steel hoops, and rests on wooden blocks. The steel pipe (there are two of them) are of inch steel, with a diameter varying from 40 inches at the top down to 21 inches at the bottom. They rest on concrete piers, and are further held in place by several massive concrete anchors.

THE POWER-HOUSE.

At the foot of the slope is the power-station, built on a marvellously convenient little flat on the eastern bank of the Ouse, the only one suitable for the purpose. As Mr. Butters pointed out, to be bound for several miles up and down the river.

The water is passed into the power-station through needle valves eight inches in diameter, and at a pressure of about 55 lb. to the square inch. The jets of water from these valves strikes the two Pelton wheels, or rather the series of buckets or cups which each wheel carries, and these wheels set in motion the two large turbines at present installed. Each turbine revolves at a speed of 355 revolutions per minute, and generates 1,300 horse-power, with a voltage of 6,600 volts. The foundation has already been prepared for a third turbine, and others will be added as required. When the water has done its work it flows by a by-pass into the River Ouse, which is only a few yards distant.

The power-house also contains two Pelton-wheel driven exciter sets, each of 125 kilowatts for 160 horse-power, which supply an "exciting" current for the large turbines, and also serve an auxiliary plant to supply light and power for the power-house and the station.

From the turbines the electric current generated at 6,600 volts is passed by means of electrically operated switches and low tension bus-bars to the transformers, where it is transformed up to 88,000 volts, the transmission line pressure. At this pressure it is transmitted to the New Town step-down station, where it is again stepped down to 6,600 volts.

THE STATION.

Naturally, quite a little settlement has grown up near the power-house on the flat along the river bank. There are the houses of the station superintendent and staff and of other employees of the department, workshops, stables, and other buildings, which make up quite a respectable little township, with more than a dozen houses in all, not to mention the other buildings. Some paddocks have been cleared and put under crop, and gardens have been made. Within a few yards of the power-house flows the River Ouse, a strong and rapid stream, larger to all seeming than the Shannon was under natural conditions, which carries by every day millions and millions of gallons of water. Some day in the not distant future most of this may be diverted into the Great Lake, and returned to the Ouse again at this point, after yielding for the use of the State many thousands of electrical horse-power. Unless one remembers what has called the settlement into being it comes as a surprise to find the place all lit up with electric light and the latest things in electric radiators, electric toasters and cookers, etc., in use.

IMPORTANCE OF THE SCHEME

"BIGGEST THING IN AUSTRALIA."

THE ENTERPRISE AND THE WEST COAST.

PARTICULARS OF MOUNT LYLELL CO.'S PROPOSAL.

His Excellency the Governor-General was greatly struck by the great advantages and possibilities possessed by this scheme. He remarked at luncheon on Saturday that nothing that he had seen in Australia seemed to him to possess greater prospects of industrial development than our water-power scheme and its connections.

MOUNT LYLELL COMPANY'S PROPOSALS.

Knowing that the Mount Lylell Company proposes to be the biggest customer of the Hydro-Electric Department, "The Mercury" representative on Saturday saw Mr. Bowes Kelly, chairman of directors of the Mount Lylell Company, and asked his opinion of the scheme, and the influence it was likely to have on it.

"This is going to be the biggest thing, industrially, in Australia," said Mr. Bowes Kelly, "when you consider the developments it is capable of and the fact that it is here for all time. Take any mine. No matter how good or how big it is, you know it must come to an end some day, but this scheme goes on practically for ever. As long as the rain falls and the Great Lake remains where it is, you can continue to develop power from it. You may take it for granted that the Mount Lylell Company were fully satisfied that the undertaking is going to be a success, and that the power can be developed before they agreed to the department's terms for supplying a block of power rising eventually to 50,000 horse-power. Think what that means to the West Coast and to Tasmania generally! The Mount Lylell engineers' report on the Hercules-Hosebery properties, over which the Mount Lylell Company has an option, states that there are at least 800,000 tons of ore in sight, with an average value at pre-war prices of between £9 and £10 per ton. They have allowed nothing for the value of the sulphur contained in the ore, which is about 26 per cent., and you can be assured that their estimates are very conservative. It is safe to assume that the value of the ore in sight in these properties amounts in round figures to £10,000,000, and the total value must be much more."

"The General Manager of the Mount Lylell Company (Mr. Sticht), added Mr. Bowes Kelly, 'advises us that he is satisfied, as the result of inquiries from his friends in America, that electrolysis is applicable to the treatment of these ores. This is one of the reasons why the Mount Lylell Company has agreed to take such a large quantity of power from the Hydro-Electric Department. We also require the power for the extraction of the sulphur from both the Mount Lylell ore and those of the Hercules-Hosebery group."

SOME INTERESTING COMPARISONS.

LAKE MARGARET AND LAKE COLERIDGE.

The first hydro-electric enterprise in Australasia was a Tasmanian venture, the Launceston power station, which develops 1,400 horse-power. Though the capital cost was heavy, in proportion to the comparatively small amount of power obtained, the Launceston Corporation has found this a profitable undertaking, and the Launceston people are entitled to much credit for their energy and enterprise in blazing the trail. A much bigger enterprise of very long standing is that which serves Waikato (N.Z.). The last few years have seen the installation of three much larger hydro-electric plants, one in New Zealand and two in Tasmania. The former is the Dominion Government's works at Lake Coleridge; in Tasmania we have the Mount Lylell Co.'s Lake Margaret undertaking, which has been in full running order for some time, and now the State Government's Great Lake scheme, the largest hydro-electric undertaking south of the line is in active operation. It may be of interest to give some comparative figures for these three works. In connection with the horse-power, it is to be borne in mind that at Lake Coleridge some additions, which will bring the total horse-power up to about 10,000, are now nearly completed. It will be noted that the effective head of water at Lake Coleridge is less than half that at the Ouse power station, and that the latter and Lake Margaret are nearly on a level. The figures, supplied by the courtesy of the Treasurer (Sir Elliott Lewis), are:—

	Great Lake	Lake Margaret	Lake Coleridge
Area (sq. miles) ...	42	1	144
Height above sea (ft.) ...	3,250	2,150	1,667
Effective head (ft.) ...	1,163	1,100	465
Turbines (horse-power) ...	9,800	97,000	6,450
Transmission line (miles) ...	62½	4	65
Line voltage ...	66,000	6,600	66,000

*Three units, giving 5,250 horse-power actually working, and a fourth kept as a stand-by.

It may be noted that the Great Lake works have a wooden pipe, 4 ft. in internal diameter, 3,650 ft. long, for the first part of the fall to the power station, and two steel pipes, varying from 40 in. to 27 in. in diameter and 4,200 ft. in length for the last part. Lake Margaret has a wood pipe of the same diameter and 7,150 ft. long, and a steel pipe varying from 30 in. to 21 in. and 2,950 ft. in length. At Lake Coleridge the water is taken through a tunnel 7,100 ft. long, and then two steel pipes with a diameter of 4 ft. 4 in. and a length of 2,730 ft. take it to the power station.

THE THREE SCHEMES.

SIR ELLIOTT LEWIS'S IMPRESSIONS.

It happened that there was at least one visitor present on Saturday who had seen the three schemes mentioned in the preceding section. This was the Treasurer (Sir Elliott Lewis), who has visited Lake Coleridge, Lake Margaret, and the Great Lake.

Speaking to "The Mercury" representative, Sir Elliott Lewis said that the Lake Margaret scheme was hardly of a nature comparable to the other two. It was designed for a quite different purpose, to serve the company's own mines and works, and incidentally to supply light to Queenstown. Lake Coleridge was, like our own scheme now, a Government undertaking, and in other respects could fairly be compared to the Great Lake scheme. Its aim was to supply light and power to Christchurch, to be used for running the tramways, lighting the city, and supplying power for factories. Of course, Christchurch was a city about twice the size of Hobart, and probably needed all or most of the power Lake Coleridge could produce. When he saw the Lake Coleridge scheme, in January, 1915, it was at about the same stage as our scheme was a fortnight or so ago; they were just drying out. The main difference between the Lake Coleridge scheme and the Great Lake was that the former had less than half the head which ours has. This meant that they had to have much more machinery and more water to produce the same power as we got. When he was there, Lake Coleridge had three units, producing 6,450 horse-power, but he understood they had now installed, or nearly finished installing, another unit, which brought the power up to 10,000 horse-power, or the same as that of the plant now installed at our power station. It was estimated at that time that the total capital cost for the 10,000 horse-power would be £375,000, or slightly more than our cost. It was to be remembered that the transport difficulties were nothing like so great as for our scheme. In New Zealand they had a good road right up to the site of the station, and the nearest rail-head was not far off. The country, too, was less elevated and not so difficult. Their transmission line, too, was of a less permanent nature than ours. On the other hand, at Lake Coleridge their power-house was a fine ferro-concrete building, which was certainly ahead of ours, which would probably have to be rebuilt. Taking all things into comparison, and remembering that the New Zealand scheme was completed earlier than ours, and that the cost was less affected by war conditions than ours, he thought our scheme compared more than favourably in point of cost with the New Zealand's Government scheme.

TO-NIGHT'S MEETING.

The official ceremonies in connection with the inauguration of the State's water-power enterprise wind up to-night with a public meeting at the City-hall, when His Excellency the Governor-General will connect the power through to the Hobart distribution system for the first time. The speakers include the Governor-General of Australia, the State Governor, the Premier, and the leader of the Opposition.

May 9, 1916

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THE HYDRO-ELECTRIC SCHEME.

In the presence of a large and thorough, by representative gathering of people, the Governor-General last night completed the last connecting link in the chain which, beginning at the Great Lake and finishing, for the present, at Hobart, is to carry electrical energy, born of water power. How much more of it there is to be, how much further the chain is to be extended, no one can at present say. It is known that power must be sent on to North-West Bay for the manufacture of Carbide of Calcium; that before very long it is to be carried across to some point on the West Coast, where the Mt. Lyell Company will use anything from 20,000 horse-power upwards; and there is a probability, almost amounting to a certainty, that the Amalgamated Zinc Company will secure another large block, of not less than 10,000 horse-power. The City of Hobart and the suburbs are, from now onwards, to derive their street lighting, and a great deal of their house lighting, from this source, and there are many contracts in existence for the supply of power on a small scale. All these things justify the belief that in the course of time—probably no long time—the whole of the power easily available will be utilized, and the engineers will have to consider what other sources can be tapped with advantage. We do not share the opinion of Mr. Earle that this cheap power is going to make Hobart the greatest industrial centre of the Commonwealth, but there is no doubt at all that it will encourage many new and great industries in which cheap power is the chief consideration. The opening ceremonies have been carried out under most auspicious conditions, and the prospects even of the almost immediate future are so bright that the people of Tasmania have every reason to rejoice in the promise of prosperity.

THE HYDRO-ELECTRIC SCHEME

THE OPENING CEREMONIES.

LINKING HOBART WITH THE SYSTEM.

THE SWITCHING ON OF THE LIGHT.

SPEECH BY THE GOVERNOR-GENERAL:

The ceremonies attendant on the official opening of the State hydro-electric enterprise wound up last night with a public meeting at the City-hall, during the course of which His Excellency the Governor-General switched the current generated at the Waddamana power-station on to the Hobart distribution system for the first time.

The public interest taken in the event was shown by the fact that the hall was well filled throughout. Altogether, there must have been over 3,000 people present. His Excellency the Governor-General presided, with the State Governor on his right. On the platform were the Chief Justice (Hon. H. Nicholls), the Premier (Hon. W. H. Lee), the Treasurer (Sir Elliott Lewis), the Attorney-General (Hon. W. B. Propert), the Minister of Lands and Works (Hon. J. B. Hayes), the Honorary Minister (Hon. H. Hayes), the leader of the Opposition (Hon. John Earle), the Chief Engineer and Manager of the Hydro-Electric Department (Mr. J. H. Butters), the Mayor of Hobart (Alderman Macleod), Mr. J. H. Gillies, Hon. Staffed Bird, Hon. H. Dobson, Hon. J. W. Evans, C.M.G., Hon. G. C. Williams, Hon. A. Morrissey, Hon. W. A. Woods, the Under-Secretary (Mr. D'Arcy Addison), Colonel Evans, Captain Walton Drake, Captain M. McArthur, Captain Matthews-Donaldson, A.D.C., and Captain Lloyd.

The front seats of the hall had been reserved for the members of Parliament, wardens of municipalities throughout the State, for the heads of State departments, and other public men and holders of official positions, and the invitation had been very widely taken advantage of.

The platform was being faced with the flag of the Allied nations, and in the centre was the State's coat of arms, recently approved by the Royal College of Heraldry, shown in public for the first time. This is an outline of Tasmania. In the centre is a shield, on the top of which is the lion passant of our State badge, while on the left is a lion gardant, and on the right a female figure with a rather rascally face, with the cornucopia of abundance. The quarters of the shield represent some of the staple industries of Tasmania, wheat, a symbol representing hydro-electric power, wool, fruit, and hops. The symbol of hydro-electric power consists of a pillar with the wings of Mercury, and a thunderbolt. The motto is "Ubertas et felicitas" (fruitfulness and happiness). The decorations were designed by Mr. L. Dechaineux, in consultation with the Hydro-Electric Department and the Under-Secretary's Department.

His Excellency the State Governor said:—The people of Tasmania are deeply indebted to His Excellency the Governor-General for having consented, in spite of his many arduous duties, to come here and open this great undertaking. I desire to express most fully the deep obligation I feel, as His Majesty's representative in this State, to His Excellency. I trust that this will become one of the greatest enterprises of the Commonwealth. I will now ask His Excellency to connect the light with the distribution system of the city of Hobart, the capital of Tasmania. (Cheers.)

His Excellency the Governor-General (Sir Ronald Munro Ferguson), who was received with cheers, said:—Your Excellency, ladies, and gentlemen, in switching the light on to this hall I feel that something more has been done than that. It means that Tasmania has been switched on to the main current of the industrial life of Australia. (Cheers.) It has been not only a pleasant public duty for me to come here, because Australia has been watching this development with the greatest interest, but it has been a personal satisfaction, because all my life I have had close family and other ties with this State. And I have met here

my old friend and colleague in the House of Commons, your State Governor, who was a distinguished figure in that House. (Cheers.) By the way, we sat on opposite sides then. (Laughter.) We have been able to see the whole of this undertaking, and it would be hard to call to mind a tour conducted under circumstances so propitious. It has enabled me to see the good work done. I advise everybody here to make a similar trip as an opportunity offer. When I go back to the mainland I shall advise everyone I meet to come and do the same. (Cheers.) The scheme looks so simple, that at first sight one might say that any fool could have thought of it. (Laughter.) From the big lake, through the canal, the settling reservoir, and the pipe line to that in house with its machinery, and then along the long line of towers bringing the electrical wires into Hobart, which reminded me of Alhar's milestones leading out of Agra, in India, the whole thing has been detailed into one huge undertaking. Tasmania has been regarded, as I have hinted just now, as slightly out of the main current of industry, but if you let those 10,000 horse-power into Sleepy Hollow itself, let alone 100,000 horse-power, it is going to make some stir. The power which we have turned on will do a great deal more than turn Hobart into a city of light. It will be pleasant to have electrical light in your houses. Judging by my municipal experience, it will be a cheaper form for cooking purposes, which is a great help to the housewife. The housewife is a person who must not be left out of account, especially in Australia. When the men take care to see that their own hours are not too long, they may well try to see that the women of Australia do not work unreasonably long hours. I do not think I have ever been more impressed with the work of any women than when I saw how well the women of the Malacca districts brought up their children in the face of great difficulties. (Cheers.) It did the greatest credit to the way the ideals of family life were maintained under most adverse conditions. Anything that can be done to relieve the housewives and mothers should be done. Therefore, I trust that Hobart will benefit greatly from this undertaking. Then there are the smaller industries, which will benefit immensely from this provision of this power. The home industries and the small employer are placed, by the use of electrical power, on a far more equal footing with the great employer and the large concerns. In this way Hobart and the other centres served by this power will benefit enormously. (Cheers.) We have been told how necessary it is to prepare for the economic struggle which will follow upon the war, and we know how great a factor the application of electrical current has been in the development of great nations like Germany and the United States within the last few years. I do not see how anything better could have been done for Tasmania than the utilization of the water-power available on the heights of the interior. The opening of the steel works at Newcastle meant the establishment of a basic industry on which all other industries depend, more or less. When the good fair passed over Australia she scattered all her choicest gifts, but the water spirit established herself in Tasmania alone. And her cup in the central hills is filled to overflowing, and man has shown that he can keep it full to the brim. The power that can be extracted from the rain drawn from the ocean will be available longer than the coal seams of Newcastle herself. This power can be made to serve whatever industry is started in Tasmania. One thing I would like to mention, and that is that not only have many parts been detailed in this one great industrial undertaking, but all sorts of men and all kinds of qualities have been used and called forth in carrying out this work. The men with local knowledge,

scientists, capitalists, masters of finance, the Government and people of the State, have all shown their best into the pool. (Cheers.) It is the united efforts which have brought about this great result. As a result of all their energy and enterprise and toil it is possible to make it plain by merely moving this little instrument what power has been brought here. This development will influence our whole national and industrial life, and if the same qualities are applied to carrying on the industries there is no doubt of what the commercial future of Australia will be. (Applause.) The scientist, the man of action, and the captain of industry must work together. The captain of industry and the man who works for him have not always the highest opinion of one another. A friend of mine in Scotland was about to get into a railway carriage when he saw a man with his coat off lying on the floor. The man said, "I suppose you have a constant quarrel with me. My friend nodded, and the other fellow said, 'The feeling is mutual.' But now we take our hats to the men of science and of industry. It is only the combination between science and industry, applied to our industrial and commercial problems, which will enable Tasmania to enter fully into the open competition in the markets of the world. We may have the most skilful drawn-up arrangements for keeping out German goods after the war—(cheers)—and to promote the circulation of commerce within the Empire, to develop our industries, but those will not be effective without the qualities I have already indicated, and which have been shown in bringing this power to use. It is these which will make Australia one of the great commercial nations and one of the most populous nations in the world. There seems no reason why the population of Australia should not rival those of the leading countries of the old world and of the new. The war has shown that to cope with a nation like Germany numbers are essential. The record of Germany and of the knowledge, thrift, industry, and perseverance are all necessary to give a nation a great commercial position. It is not skilfully drawn arrangements, legislation, combination, or anything of that kind, but the energy and capacity of the people, their strength of purpose, and the determination which has been shown in developing this power with which Providence has endowed us that will achieve such results. I am convinced that these qualities will not be lacking, and that a bright day is dawning for Tasmania. (Loud cheers.)

SPEECH BY THE PREMIER:

The Premier (Hon. W. H. Lee) said it was his pleasing duty to express their hearty thanks to the Governor-General for honouring the State of Tasmania by performing the opening ceremony in connection with the hydro-electric scheme. It was, indeed, an honour that the representative of the King in the Commonwealth of Australia should come to Tasmania on the auspicious occasion of the inauguration of a scheme of such magnitude and such importance. In Tasmania for many years past they had laboured under the stigma of being a slow and unprogressive people, and it was all the more gratifying that at last they had risen to a recognition of the vast potentialities of their State, and seen the wisdom of turning them to account. In the hydro-electric scheme they had an undertaking exceeding in magnitude anything of the kind hitherto attempted. It should also be remembered that the scheme as at present carried out had not reached the full extent of its possibilities. By utilizing the head waters of the Ouse it would be possible to get a much greater horse-power than they possessed at the present time. The carrying of the hydro-electric scheme to fruition was due in some measure to certain local residents. It was also due largely to the enterprise of Mr. Gillies, one of the directors of the Complex Ore Company. He wished to say that they were much indebted to the late Government for the part they had played in forwarding the scheme. (Applause.) He desired to pay a tribute to the intense earnestness and zeal which had been displayed by Mr. Earle, the late Premier, who had done all that it was possible for a man to do to bring everything to a successful issue. Mr. Earle must, indeed, feel proud of the part he had played in the undertaking. He had to acknowledge the splendid organising ability of Mr. J. H. Butters, the chief engineer and manager of the Hydro-Electric Department, the fine business faculty and the tireless energy that gentleman had displayed in carrying through the vast scheme to a successful conclusion. Everyone now realised the extent to which the Germans had practically monopolised the metal industry, but with the immense possibilities of such undertakings as that controlled by the Hydro-Electric Department the prospect of any recurrence of that state of affairs was a very small one. He had the honour to present to the Governor-General, on behalf of the Government and people of Tasmania, an album of views which, he hoped, would serve to remind His Excellency of his visit to the State. (Applause.)

THE LEADER OF THE OPPOSITION.

The Leader of the Opposition (Hon. John Earle) said it was his pleasant duty to thank the State Governor (Sir W. Ellison-Macartney) for having induced the Governor-General to come to Tasmania for the purpose of performing the ceremony of inaugurating the hydro-electric scheme. He felt sure that without the persuasions of the State Governor there would have been some difficulty in inducing Sir Ronald Munro Ferguson to come to the island State for that purpose. He had had the pleasure of going round the works during the past few days, and he had noticed with gratification the keen interest displayed in everything connected with it by the Governor-General. He was confident that when Sir Ronald Munro Ferguson returned to the mainland he would be a strong advocate of the Tasmanian hydro-electric scheme, and help it forward on every possible occasion. Nothing could give him greater pleasure than to take part in that public meeting. Long ago he had realised the great possibilities of the harnessing of the water powers of Tasmania, and it was something for them to realise that in their comparatively small island they had greater latent resources in that respect than were to be found in any part of Australia. In Tasmania, too, they had a climate second to none in the world. They also had deep-water ports, where the raw materials for their manufactures could come in in the largest vessels that had floated, or ever would float. In conclusion, he deduced to present to the State Governor (Sir W. Ellison-Macartney) an album of views, which would serve to remind him of the occasion, and he hoped that before His Excellency left Tasmania he would be able to open large metallurgical and reduction works, which would be rendered possible by the fact of the hydro-electric power having been made available. (Applause.)

The National Anthem was sung, and three cheers given for the King and the Governor-General, after which the proceedings terminated.

FUTURE OF THE SCHEME

THE DEMAND FOR POWER. ELECTROLYSIS OF WEST COAST ORES.

The chief engineer and manager of the Hydro-Electric Department (Mr. J. H. Butters), when asked by a "Mercury" reporter last night if he could say anything about the future development of the undertaking and the demand for power, said:—

We have now completed the first stage of the scheme, but it should be borne in mind, the first stage only. As the Premier stated, the intention of the Government is to extend the works from time to time as new business warrants it. The State has been full of pessimists in regard to this scheme ever since it was mooted, but when I tell you that the amount of business is sufficient to make the scheme a financial success from the moment the new business is connected up, you will see that the pessimism was unfounded. The Premier, in his address, referred only to the business which had been actually secured by contracts. There are also contracts for a large amount of power under negotiation, and in such a stage of negotiation as makes it certain that a very large proportion of the business will be secured. I can say from the information at my disposal that I am confident there is not the slightest doubt that within three years enough business will be in hand to warrant the triplication of the present scheme. The contracts actually secured include that with the Hobart City Council for the supply of power, that with the Hydro-Electric Co. for the supply of 3,500 h.p. for the making of calcium carbide, with the probability of a considerable extension for the purposes of the manufacture of metallic zinc from complex ores, and one with the Amalgamated Zinc (De Baray) Ltd. for the supply of 4,000 horse-power for the treatment of Broken Hill concentrates.

"Amongst the negotiations in train," continued Mr. Butters, "the principal are one with a large London syndicate, who propose to embark on the production of ferro-alloys, and another with the Mt. Lyell Co., which wants as much power as the Government can supply for the treatment of West Coast ores. The inquiries are of such a nature as to justify the department in at once investigating sources of supply other than the Great Lake and the River Ouse. The preliminary investigations have already been made, and these will now be proceeded with rapidly, in order to enable the department to see exactly how much business it will be justified in taking on."

WORK OF THE STAFF.

"On the completion of a scheme such as this, much credit is apt to be given to the chief at the expense of his staff," added Mr. Butters. "I desire to make grateful acknowledgment that an immense share of credit is due to those who have been associated with me in bringing this scheme to the completion of the initial stage of its development. I would call to remembrance and bring to special notice the following gentlemen:—Mr. W. McK. Jeffrey, who, as resident headworks engineer during the Hydro-Electric Co.'s time, was of the utmost assistance under extremely trying circumstances, in connection with the original design and lay-out of the headworks; Messrs. E. C. Crough and N. C. Harrie, who did good work as assistant engineers; Mr. J. L. Butler, who has been associated with me during the time both of the company and of the department as surveyor from the absolute commencement of the scheme; Mr. C. C. Halkyard, who was assistant engineer with the company, and has been resident headworks engineer with the department, and has done splendid work in regard to various details of the scheme; Mr. E. A. Bennison, who has acted as transport superintendent under conditions which have been far from pleasant or easy; Mr. A. Griggs, the transmission line superintendent, whose supervision of the erection of the line has been most capable, and Mr. N. V. Wilton, who has been engineer in charge of the erection of the converter station and high-tension transmission system."

HYDRO-ELECTRIC WORKS

Completion of Great Lake Scheme

Governor-General at Miena

Rough Passage Across the Lake

Multiple Arch Dam Opened

(By Our Special Reporter.)

MIENA, January 17.

At Waddamana to-morrow (Thursday), His Excellency the Governor-General (Lord Forster) in starting up No. 3 turbine and switching on power to No. 4 transmission line, thereby completing the power station, and making available an additional 15,000 horsepower to the Electrolytic Zinc Co. at Bladen, will conclude a task which marks a further step in advance in the history of the hydro-electric undertaking in Tasmania.

His Excellency, when at Miena, performed a task preliminary to that at Waddamana by opening the new multiple arch dam at the Great Lake.

The Governor-General and Lady Forster and other members of the viceregal party, having left Deloraine at 5 o'clock this morning for the Great Lake, reached Miena just before 2 o'clock, about an hour after scheduled time. The delay, regrettable as it was, could not be avoided, for the weather was not in a mood to fall in with the arrangements which had been made for the reception of their Excellencies. The elements were, indeed, distinctly unfavourable; a chilly wind blew across the lake, and the surface greatly resembled that of the open water of our island coasts. Billows were chasing each other, and the motor-launch in which the viceregal party were embarked at the northern end of the lake experienced the roughest of passages.

In addition to the Governor-General and Lady Forster, the party on board included the Premier (Hon. J. H. Hayes, C.M.G.) and Mrs. Hayes, Mr. J. H. Butters (General Manager of the Hydro-Electric Department), and His Excellency's aide-de-camp. The storm-tossed boat eventually reached the landing place, but the difficulties were not yet over. To effect a landing with safety and with the least amount of inconvenience was no light undertaking, and proved to be one which was impossible to perform. To the full degree Lady Forster suffered a cramping. A dinghy was brought for landing purposes, and, like a cork on the water, was greatly buffeted. However, the landing was effected without serious mishap, and once ashore the most unpleasant part of the day's excursion was over. An excellent and perfectly satisfying luncheon was served at the Great Lake Accommodation House, the meal being devoid of all formality, for speeches were taboo. Afterwards the viceregal party proceeded to the multiple arch dam, which confined the waters of the lake until they were liberated by the opening of the sluice gates. The dam is about 100 yards distant from the Accommodation House, and the Governor-General and those with him made their way there on foot.

The opening ceremony at the dam was of the simplest possible character. His Excellency insisted on personally turning the wheel which opened the sluices, but the task was not quite so easy as it appeared at first sight. Workmen were commanded in order to lend the required assistance, but when the gates had been raised a tremendous volume of water rushed through, affording ample evidence of the pressure against the barrier. As the water forced on its way beneath the gates and ran onwards towards the power station at Waddamana, the assembly of spectators cheered lustily. Practically every inhabitant of Miena was present to witness the ceremony, which made the day noteworthy in Tasmanian hydro-electric annals.

That the Governor-General enjoyed the experience was apparent to all beholders, and when the task had been successfully accomplished, he showed a touch of that kindly nature which is characteristic of him. His Excellency did not omit to thank the men who had assisted him in his work. Before he left the scene he smilingly remarked, "I must not forget my watch," and shook hands with the men who had turned the wheel with him, and also with the foreman (Mr. Smith), who explained to the party the working of the sluice gates and other matters associated with the dam.

The Governor-General, the Premier, and Mr. Butters subsequently left by motor-car for the intake, where the Shannon waters are diverted into the canal. They then rode on horseback along the canal leading to Waddamana, and the inspection proved highly interesting. Their departure from the dam was the signal for further rousing cheers. Lady Forster, Mrs. Hayes, and the Governor-General's aide-de-camp left by motor-car for Waddamana via Red Gate, and arrived at Waddamana in advance of the Governor-General. En route from Miena, the Governor-General was met by Mr. Harry Curtis, of the Hydro-Electric Department, and Waddamana was reached in due course at about 6.30.

As His Excellency entered the settlement, the Union Jack was hoisted at the State school by Mr. Charles Pretty, an ex-member of the 15th Battalion, A.I.F. Upon arrival at the staff-house, His Excellency was formally greeted by the Treasurer (Sir Walter Lee) and Lady Lee, who had motored from Hobart during the day. The little village of Waddamana, nestling in the secluded hollow beneath a steep cliff, down which the pipe-line ran for all the world like black snakes through the bush, wore little more than its normal aspect, the erection of a maquette and various decorations being the only unusual features. The State school had been gaily decorated with flags and streamers of the Governor-General's colours—black and white.

The evening was spent by the viceregal party at the staff-house in a social manner.

The manipulation of the sluice gates permitted the pent-up water to break bounds and to leap from the gigantic natural reservoir, nestling among the overhanging hills in the centre of the State at an altitude of 3,350 ft. Thence it passed into the waterway formed by the River Shannon, and eventually found its way to Waddamana. The mighty power represented by the water is transformed at Waddamana into electrical energy—a power placed at the service of man, so that it flows and yet so calm and inappreciable in character as to be hardly definable. It is at Waddamana that the transformation process is effected, the power station of the Hydro-Electric Department being situated there. From that point the electrical energy is transmitted over conductors to Hobart, 63 miles distant, its voltage of 35,000 being reduced to a pressure consistent with industrial use at the Hobart sub-station, as already described in "The Mercury."

NATURE AND SCIENCE

Probably the truth that mind ever apprehends over matter can be no more than a simplified theory. The history of the hydro-electric enterprise in Tasmania is a hard shelling of science, lay a priceless kernel could only be extracted by the study of the most intense application of the pouring out of large sums of money. Nature has possessed her world her limitless realm. Man has had to discover them, and then to serve his needs. Up Great Lake, representing a basin 100 miles in length, and extending over an area of 40 square miles, Nature poured the water. Natural channels for it were the valleys of the Shannon and the Ouse, which were particularly adapted for the use in connection with the power, which presents a steady in levels. The Great Lake is 3,350 ft. above sea level. In its initial stages flows are considerably higher than the average, and it became possible to turn it subversively to account. At length modern science surmounted the last obstacles, and conquered the mystic current, making it fully amenable to the requirements of the human race. The current which is vital to the industry of the State, set in action the turbines and alternators at Waddamana which generate the power from the waters of the Great Lake. To-day, his successor in office is completing that work, at any rate as far as it has been carried.

DIVERSION OF THE OUSE.

Tremendous as the water storage capacity of the Great Lake was, the work of Nature in this respect had to be supplemented in its cope with the full measure of the need for power. An augmented water supply in the form of a Great Lake made greater to the extent of an increase in superficial area of from 35 to 60 square miles, offered a solution of the problem. Hence the construction of the immense dam at Miena, and the diversion of the River Ouse into what is a remarkable canal. Another waterway not intended by Nature accordingly was placed on the map of Tasmania. Crashing downwards between jagged walls of rock the Ouse, downing parallel to the western shore of the lake, is at one point only two miles from it. At that point, however, its flow is well below the level of the lake, and the engineers responsible for the feat of turning the torrent in the required direction had to seek elsewhere for the initial stage of the diversion. At an altitude of 3,470 ft., the Ouse races down a wild ravine at a spot some five and a half miles from the lake shore, and 130 ft. above it. It continues to a place where, still 90 ft. above the lake, the watershed is only some two miles distant. Five and a half miles of canal were determined on, and in 1919 the construction camp was pitched at Liawenee, the remotest of remote spots in the State 12 miles from Miena, and the jumping off place of the canal through which the waters of a catchment of 100 square miles were to be projected into the enormous saucer of the Great Lake. Throwing itself violently onwards, the river in the vicinity of Hell's Gates, was well disposed to follow any course which did not impede its progress; direction was immaterial to it. The business of diverting its flow as desired was, therefore, simply a matter of engineering ways and means. A weir had to be formed on the doorstep of Hell's Gates, and a dam was planned to carry the water along the face of the hill, and allow a continuous overflow down the atony course of the natural river bed. Ultimately a concrete barrier was keyed into foundation rock, and the river for dammed, and raised to a level at which it pressed against the flume gates.

FLUME AND CANAL PROPER.

The flume widens at length into what is known as the transition section. This is really the commencement of the canal proper, as it starts the Ouse on its changed way to the lake. The task of digging the canal was pushed on with all speed, and its magnitude is apparent from the huge mounds of displaced earth running outwards from the canal side, like buttressing embankments, at irregular intervals. When the watershed is reached, the canal finds its own flow over a stretch of two miles, with a drop of 90 ft. to the lake. The flume which leads the captured Ouse from Hell's Gates to the canal entrance has a fall of 16 ft. to the mile throughout its 2,000 ft. of length. Its five-foot depth of water, flowing at the rate of 450 cubic feet per second, is given a velocity of 10 ft. per second. The actual canal is so graded that it possesses a fall of four feet per mile. Its floor width in earth sections is 24 ft., whilst its sides, sloping upwards and outwards at an angle of 45 deg., give it a spread at the top varying according to the depth of the cut required. In rock sections, where the walls are vertical, the canal has a normal width of 31 ft. Spillways, or safety valves, are provided as protection against storm water or abnormally protracted rainfall. The canal is fenced for the protection of live stock, and is spanned by five bridges for traffic. At its end is a simple regulating device of concrete for reducing the flow of water, and an automatic recorder registers the quantity of water passed forward for the department's use. Thus the River Ouse, bridled in its wildest mood, is tamed led across strange country until it completes its diverted journey to the great reservoir to which it contributes power to be transformed, via Miena and the pipe track to Waddamana, into the electrical energy of the State. The widening of the canal was effected in 1919-21, the method adopted being that of excavating a strip of land parallel to the old canal bank, and extending to the limit of the final width desired, leaving a wall of partition, which could be removed in sections as soon as the construction of coffer dams and the installation of centrifugal pumps ahead made practicable the broadened flow of water from point to point.

THE MULTIPLE ARCH DAM.

The multiple arch dam at Miena, opened yesterday, illustrates the highest degree of engineering skill and the approved methods of construction. In their natural state, the northern, eastern, and southern reaches of the lake were possessed of a maximum depth of 16, 12, and 18 feet respectively. A gravity wall was placed across the narrow outlet from which the Shannon waters, after flowing through 17 miles of lake, continued on their downward search for the Ouse. It was planned to give the lake a uniform additional depth of 15 ft. The conservation of water effected was approximately 62,500,000,000 gallons, but an ambitious scheme was designed to hold back for effective purposes a body of water 370,000,000,000 gallons in volume. The old gravity wall was but 300 ft. water length, its width increasing from 5 ft. at the top to 14 ft. at the bottom. The crest length of the new dam, with its abutments, would have to be 3,125 ft. if it was to secure its purpose effectually, and the construction of the multiple arch dam type became the aim of the general manager of the Hydro-Electric Department (Mr. J. H. Butters). In practice the style of dam is as neat in theory as it is attractive in finished appearance. It consists of the erection of a series of buttresses keyed into basic rock and backed by arches set at an angle so as to present to the impounded water a continuity of convex faces, much as though a railway viaduct, its permanent way removed, had topped over and was holding up the valley river it was intended to span. The principle embodied is that of the interlocking action of a triangle of forces. The relieving arches, their outward curve, to the water, take the load of the water sitting upon them, and distribute its weight on to the buttresses. These are in turn bound together top and bottom by haunched beams, whose effect is to counteract the outward spread to which the buttresses are liable in consequence of the weight of the arch and water load upon them. The result is a tight interlocking of buttress, arch, and beam, so adjusted that the greater the distributed load the tighter the locking and the more unyielding the barrier to the water piled up. Reinforced concrete is the material used throughout. The advantage of the section is apparent when it is considered that where the choice had to be made between a dam of this type and that represented by the old vertical wall variety, decision in favour of the straight gravity wall would under general conditions involve the use of six times the quantity of concrete that a multiple arch dam would call for.

The purpose for which the Mena multiple arch dam is intended to serve necessitated the building of 27 linked arches of a height 40 ft. above the bottom of the lake, with an individual span of 40 ft., from centre to centre. The dam is the first of its kind to be constructed outside of America, where the new principle has been developed only during the past ten years or thereabouts, and is the longest of its kind in the world. In point of conserved water capacity resulting from its construction, and the contributory diversion of the Ouse, the Great Lake (as a storage reservoir) will rank fourth in the world's list of artificially augmented sources of water supply. Its water area of anything from 571 to 60 square miles at the 35 ft. level (approximately one-third of the actual Great Lake catchment area) gives it a conserved capacity of 50,000,000,000 cubic feet, or 312,500,000,000 gallons of water.

The weather does not look too promising for to-morrow, the sky being heavy with clouds, but in the event of fine weather Waddamana will be quite the centre of attraction when the Governor-General carries out the ceremony at the power-house.

THE SLUICE GATES.

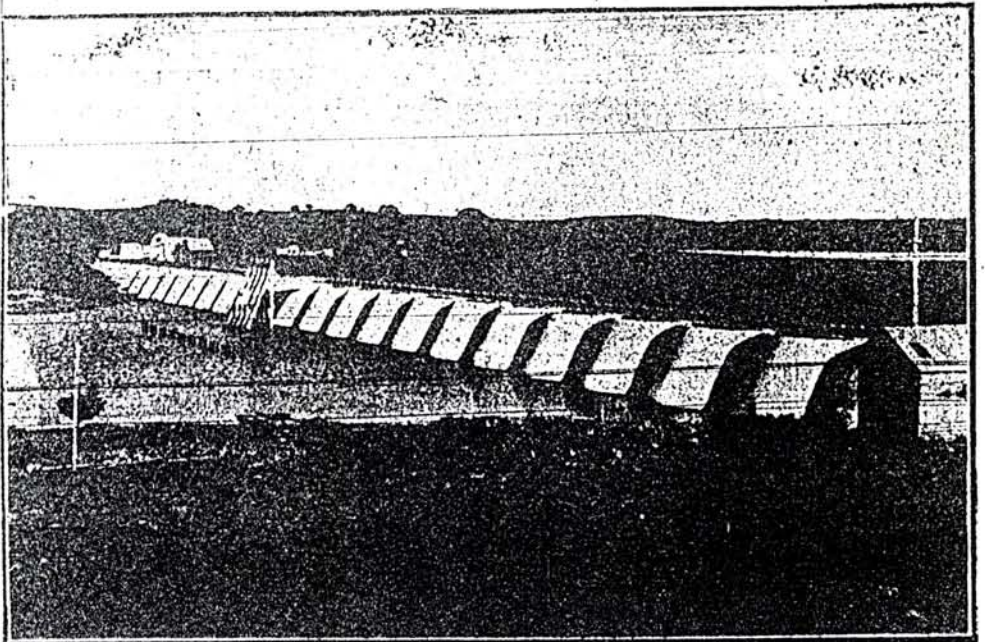
On the opening of the sluice gates the mass of water impounded at Mena, behind the great wall of the multiple arch dam, forces its way through the outlets in proportion as the regulating pressure of the iron collar fixed about its neck is tightened or relaxed. Foaming along the short distance separating it from the connected lagoon, it flows through the shallow depth of a reedy marsh until, at its south-western end, it emerges as a compound river and tumbles down the stony bed of the original Shannon until it is directed through canal and pipe lines to the power station at Waddamana.

THE CANAL INTAKE.

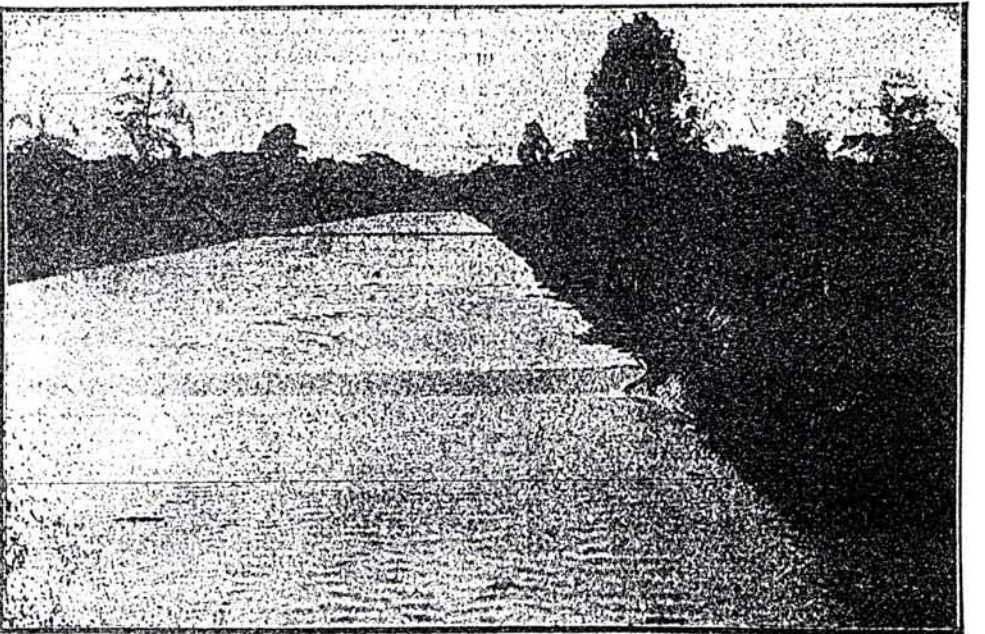
Four and a half miles from the escape point at the Great Lake, the water makes acquaintance with the intake of the watercourse planned for its reception by the old Hydro-electric Company, and already carried out before the Government took over the scheme. The placing of a dam, with weir, across the narrow river bed, allows the Shannon, with its mingling Ouse water, to be swung out of its course in much the same way as that by means of which the Ouse is diverted at Liswennie. Falling a distance of 250 feet from Mena to the canal intake, the lake water descends a further distance of 60 feet, while passing through its three and a half miles of length. Effective checks on any tendency to too great a rush on the part of the twin rivers were necessary, and to this end is provided a series of masonry and concrete "drops," against and over which the water falls. There are 19 such curbs, some of them so slight that nothing but a rippling backwash indicates their presence. Others are so substantial that they create quite substantial waterfalls.

PENSTOCK CHAMBER AND PIPE LINE.

The canal at its termination broadens into a lagoon which covers an area of 200 acres, and extends for a mile in the direction of Waddamana, forming another natural reservoir 3,000 feet above the sea, and 1,120 feet above the power house. This forms the starting-off point for the pipe line, which constitutes the final link in the Ouse-Great Lake-Shannon-power house chain. The lagoon has been strengthened to conserve the augmented supplies of water, and is provided with a spillway, and the all-important penstock chamber—a concrete box sunk to a depth of 20 feet below the level of the lagoon and divided into four compartments, corresponding with the lines of piping that extend beyond. Along parallel tracks the pipes run, resembling in large measure mammoth serpents heading south. They are of wood and steel, and confined within them is the united strength of all the water from the catchment areas of the Great Lake and its contributory rivers and rivulets. The pathway over which the pipes are laid runs for a distance of 100 yards with but little southward fall, but in the stretch of one and three-quarter miles which separates the penstock chamber from the power house, there is a total fall of 400 feet before the final drop to Waddamana, down a precipice of 225 feet, to swirl into the power house beneath. The original wood piping followed between the penstock chamber and the final drop, four feet in diameter, was of Oregon. This merges into welded steel pipes three feet in diameter. A five-foot pipe of Oregon was subsequently laid from the penstock chamber, and additional massive piping followed as the supplementary need arose. Karri wood has been utilised to a certain extent. The wooden pipes are bound with locking steel rings, on wooden bed logs. To carry the steel piping down the final drop heavy concrete piers are keyed into the rock, and at special points of outward strain, the lines run through massive concrete anchors, numbering 15 in all. Ingenious safety appliances guard against the damaging effects of pipe breakage.



The Reinforced Concrete Multiple Arch Dam, opened yesterday by the Governor-General.



The Waddamana Canal, showing Water drop.

The Mercury.

HOBART: FRI., JAN. 19, 1923.

WADDAMANA.

A few years ago Waddamana was a rugged tiny valley through which the Ouse River ran. No one lived there, its inhabitants being giant trees, and perhaps an occasional kangaroo. Yesterday it had a motor-car visitation from all directions, and it had the appearance of a thriving market town. There are streets of cottages, a school, offices, and a great works. The place that the other day was forest had become the industrial heart of Tasmania. It was a novel experience to travel for many miles through almost uninhabited country, and then to drop into the midst of this busy hamlet. It was like a transformation scene, and the effect was enhanced by the brightness of the sun that shone upon it. All those present were greatly impressed by this wonderful place and all it means. Behind the hamlet rises a difficult face 750 feet high, and down this were seen six lines of huge pipes anchored to the rock with concrete buttresses. Above this big drop is a further fall of 400 feet. It was hard to realise that the water filling these pipes reached the turbines at such a pressure as to produce 63,000 horse-power. Within the big power-house—no other word would describe it—were the nine great turbines or Pelton wheels that are turned at enormous speed by the pressure of this water applied to each from a nozzle delivering upon the latest type of Pelton bucket. Within the power-house all one sees is shafting working within the turbines, and at the rear of the building are found the huge pipes that lead the water into the nozzles. To understand something of the power being used, the visitor has to see the water rushing from below the power-house into a canal that carries it swirling to the Ouse river. It comes from the turbines with a swish and roar that are indicative of tremendous force. Everything about the power-house is kept in perfect order, like a warship, and indeed the same remark applies to the whole of Waddamana. There is evidence everywhere of discipline and good management. The feeling of the Tasmanians present was that of natural pride that their State should have achieved so great a thing; that of the visitors was unbounded admiration. Here, we had the river Ouse in its upper levels and the impounded waters of the Great Lake trapped within the pipes, speeding through the power-house and racing into the lower Ouse. There is no waste of water; it is trapped, harnessed, used, and then released. It has been doing man's work for some years now, and unless a physical cataclysm takes place, it will perform the same task hundreds of years hence. But for the fact that a man of inventive genius, firm courage and infinite resource found that he needed cheap power to apply one of his discoveries, the waters of the Great Lake and of the Ouse would have been running idly to the sea to-day. That was Mr. J. H. Gillies, and it was fitting that he should be present at the completion of the great scheme which he, with the assistance of engineers, devised. It must be remembered that the Ouse diversion, and the additional pipe lines and turbines, were provided for in his scheme, which, with some variations, has been followed closely. Another man who must have felt elation yesterday was Mr. J. H. Butters, upon whose shoulders have rested the great burden of constructing these immense works in a region very difficult of access, and in a winter climate that is Alpine. Those who inspected the pipe and span power-house with its machinery working smoothly, and the orderly pipe line, and those who had seen the multiple arch dam, would have no conception of the obstacles Mr. Butters and his assistant engineers had had to surmount, or the hardships the workmen often had to endure. It was the day of the man who conceived the plan, and the men that carried it out, though of course, the politicians fairly claim the credit of having made the work possible. It was evident that Lord Forster was greatly impressed with the whole project, and that he realises the potentialities with which it has endowed Tasmania. His speech at the luncheon included graceful allusion to the scheme as a triumph of peace. The Premier delivered a speech full of confidence in

the future of Tasmania industrially on account of her cheap power, and he bestowed credit upon those responsible for it all. More than that, he announced that Mr. Butters had informed him that surveys had been made which showed that a further 300,000 horse-power may be developed when required. Thus it will be seen that the State's hydro-electric career is just opening, and that there are certain to be more wonderful Waddamanas.

GOVERNOR-GENERAL AT WADDAMANA

Completion of Hydro-Electric Equipment : Additional Power Transmitted to Hobart

Congratulatory Speeches at Official Luncheon

Waddamana, Jan. 18.

Continuing his official task in connection with the scheme of hydro-electric development in Tasmania, His Excellency the Governor-General (Lord Forster) visited the power station of the Hydro-Electric Department at Waddamana to-day, and played the leading part in an interesting ceremony. This included the starting-up of No. 9 turbine, thus completing the power station of 63,000 horse-power capacity, and making available 15,000 horse-power to the Electrolytic Zinc Works at Risdon. It also included the switching on of power to Hobart over No. 4 transmission line. This line is the latest installed. It reaches the "stepping-down" station at Risdon (the Hobart sub-station) by means of a series of supporting towers, the two last carrying the wire span across the River Derwent at that point. In turning a wheel on the turbine, His Excellency opened a valve and allowed the water from the Great Lake, conducted in the final stage of its journey through immense pipes of wood and steel, to impinge on revolving "buckets" which gradually increase in speed until the normal rate of 375 revolutions per minute is attained. No. 9 turbine, although it is the latest addition of its kind at the power house, is in all essential particulars the same as the other turbines there. These, it may be recalled, have at various times been officially started by Viscount Novar (formerly Sir Ronald Munro-Ferguson, who preceded Lord Forster as Governor-General of the Commonwealth), Sir Francis Newdegate-Newdegate (a former Governor of Tasmania), Hon. J. B. Hayes (State Premier, and at the time Minister of the Hydro-Electric Department), Mr. W. M. Hughes (Prime Minister of the Commonwealth), Sir N. Elliott Lewis, and the State Treasurer (Sir Walter Lee).

MORNING INSPECTIONS.

It may safely be assumed that the Governor-General never spent a quieter or more reposeful night than that passed by him last night at Waddamana. The collection of iron-roofed wooden buildings, built in the roughly pear-shaped enclosure between the thickly wooded heights commanding it, and dignified by the name of a township, had its beginning in the Hydro-Electric Department, without which it would be non-existent to-day. But for the hydro-electric enterprise the site of Waddamana would be virgin bush, and in a certain respect it now is little different to virgin bush. That is why it is implied that the Governor-General spent a quiet night. The folk who occupy married quarters at Waddamana are very few, and except for their neat little homes, the post office, and the State school, there is no centre of activity in the settlement apart from the power-house, the principal building of all. The power-house is the de-all and the end-all of Waddamana's peaceful existence. Work goes on there day and night, the humblest dwelling in the village being served with light from it. As may be imagined, the social resources of the small community are very limited, and so it happens that the rule early to bed and early to rise is invariably observed by all who are not kept out of bed by the call of duty during the hours of darkness. With bedtime everything is still, save for the roar of the energy-breasting turbines and generators at the power station. So loud is the noise inside the station that conversation is carried on only with difficulty. Further off, in the habitable region of the village, the roar is deadened by distance into a gentle sound, which creates the impression that one, is sleeping by the seashore with the noise of the breakers crashing on the beach. To such a lullaby the vice-regal party slept last night, to awaken this morning with the sun shining through the windows of their apartments. The early indications were of a brilliantly fine day, with cloudless sky, but by breakfast time the sky had clouded over, and shortly after 10 o'clock heavy rain was falling. The Governor-General had no engagement until 11 o'clock, and up till that hour

His Excellency and those with him filled in the time in the easiest possible manner, billiards being the main attraction for the gentlemen, while the ladies chatted by the blazing fire. The rain prevented resort to the tennis court attached to the staff house grounds.

Later on the rain ceased, and the vice-regal party was able to commence the official programme for the day, an inspection of the State school being the first duty undertaken. The party alighted to the school, which had been effectively decorated with the vice-regal colours, black and white, and the Governor-General and Lady Forster also visited other parts of the village before proceeding to the power station for the starting-up of No. 9 turbine and the closing of No. 4 transmission line.

POWER STATION CEREMONIAL.

Between 11.50 and noon a large party of visitors and arrived from Hobart in a fleet of motor cars, which were parked in the forecourt of the staff house, and the large gathering in due course assembled at the power station, the entrance to which was gaily decorated with bunting. The Governor-General spent some 30 minutes in inspecting the station and environs, under the guidance of Mr. Butters and Mr. Harry A. Curtis (engineer for electrical construction); Mr. G. H. Evans (engineer-in-charge at the power station) being also at hand to do honour to the distinguished visitors. The ceremony of starting up No. 9 turbine was timed for 12.50, and punctually at that hour the Governor-General was conducted to the turbine, and took his stand at the wheel he was to turn in order to accomplish the desired purpose. Mr. Curtis was at His Excellency's side, prepared to afford any necessary information, and when all was in readiness His Excellency gave a few turns to the wheel. The sound of the operating machinery ensued, showing that His Excellency's work had been effective, and cheers were raised by the crowd of spectators. Photographs were taken of His Excellency "at the wheel," and of the general body of spectators, and Lord Forster, together with Lady Forster, and the members of the vice-regal party then made their way to the switching platform.

SWITCHING ON THE ENERGY.

The switching platform is erected over the main floor of the power station. Its most prominent feature is the inclined switch board of marble. On this there is a bewildering array of knobs, and two of them were distinctively marked by bows of white and black ribbon. The dimensions of the switch room on the platform were not large enough to accommodate half the number of persons who soon would have witnessed the concluding portion of the ceremonial, but it was crowded to its utmost limit. The starting-up of the turbine had occupied comparatively few minutes, and was devoid of remark from His Excellency, and a similar procedure was followed when His Excellency pulled the buttons mentioned. The first button pulled closed the switch to the turbine which had been started, thus closing it to the transformers, and when the second button was pulled there was closed the power on to No. 4 transmission line, enabling the additional current to be transmitted to Hobart.

RECORD BOOK SIGNED.

An official record book was then signed by various members of the party, the signatures being those of Lord and Lady Forster, the Premier, and Mrs. Hayes, Sir Walter and Lady Lee, Captain Forster (aide-de-camp to the Governor-General), Hon. Ernest Blyth (Minister of Lands) and Mrs. Blyth, the Chief Secretary (Hon. J. C. McPhee), and Hon. Alec Hean and Mrs. Hean.

This concluded the ceremony at the power station, and an adjournment was made to the State school for luncheon.

THE LUNCHEON.

CONGRATULATIONS FROM THE PREMIER.

LORD FORSTER'S KEEN APPRECIATION.

A gathering which was thoroughly representative of the political and industrial life of the State sat down at the State school to the official luncheon at 1 p.m., the catering being carried out in excellent style by the American Catering Co. The school building, adequate though it is for the small educational needs of Waddamana, was not of sufficient size to properly accommodate such a large company on an auspicious occasion of the kind, but all were at length seated beneath the white and black ribbons which crissed and recrossed the building, giving it just the proper note of something well out of the ordinary, as was so befitting the visit of His Majesty's principal representative in the Commonwealth. At the head of the building, seated with the Governor-General, were Lady Forster, Captain Forster, the Premier and Minister of Works (Hon. J. B. Hayes, C.M.G.) and Mrs. Hayes, the Treasurer (Sir Walter Lee), Hon. A. Hean (Honorary Minister), Hon. E. Blyth (Minister of Lands) and Mrs. Blyth, the Chief Secretary (Hon. J. C. McPhee), and Mr. J. Belton (deputy leader of the Parliamentary Labour party, representing the leader of the Opposition, Mr. J. A. Lyons). Among the other guests invited were—Sir Elliott Lewis, Senator Keating, Messrs. D. W. Addison, A. H. Bastow, J. W. Beattie, Professor Burn, C. T. Butler, L. T. Butler, J. H. Butters, H. E. Chapman, Hon. J. R. Chapman, Hon. F. B. Edwards, Hon. Herbert Hays, Hon. F. Murdoch, Hon. T. Murdoch, Hon. J. C. Newton, Hon. T. Shields, Hon. L. M. Shoobridge, Hon. J. W. Cheek, Hon. J. Darling, G. Chervinton, J. H. Cleary, M.H.A., L. M. Cowlishaw, S. B. Cox, R. F. Crosby, C. E. Culley, M.H.A., W. H. Cummins, F.C.A., H. A. Curtis, C. B. Davies, G. F. W. Echlin, G. H. Evans, Captain J. W. Evans, J. Ewing, A. P. Flockart, W. F. Forster, H. W. Gepp, T. A. Gepp, H. Gill, J. H. Gillies, P. M. Gillies, C. W. Grant, M.H.A., H. Gray, Greenwood, J. Gunning, J. A. Guy, M.H.A., A. Hackett, C. C. Halkyard, E. H. Hawson, F. W. Heritage, J. R. Johnston, P. Kelly, G. H. Loftis, Colonel J. E. C. Lord, T. Lyons, J. M. Mackay, A. T. Marshall, H. Marshall, Alderman J. A. McKensie (Mayor of Hobart), Alderman Shields (Mayor of Launceston), A. J. Miller, J. Miller, Peter Murdoch, M.H.A., C. H. Murphy, M.H.A. (N.S.W.), Murray Noel, F. M. Nicholl, W. H. Nimmo, Senator J. E. Ogden, D. J. O'Keefe, M.H.A., L. Piesse, J. P. Piggett, M.H.A., H. E. Reimer, R. G. Rogers, P. Salisbury, W. Sheridan, M.H.A., J. G. Shields, M. W. Simmons, T. A. Tabart, Jun., W. E. Taylor, W. A. Brain (Town Clerk, Hobart), J. G. Turner, N. V. S. Wilson, and Russell Young.

Apologies for absence were received from Senator Keating and the Warden of Kemplon.

THE SPEECHES.

There were but three brief speeches, by the Premier (who proposed a vote of thanks to His Excellency for his visit and for performing his tasks so wholeheartedly), by Mr. Belton (who briefly seconded the vote of thanks), and by the Governor-General, His Excellency acknowledging the thanks and supplementing the acknowledgment with remarks which showed that Tasmanian interests are quite as close to his heart as are those of the mainland States he is more familiar with.

The Premier (Hon. J. B. Hayes) said he sincerely desired to move a hearty vote of thanks to the Governor-General and Lady Forster for their kindness in coming to Waddamana, and especially to the Governor-General for performing the opening ceremony in connection with the starting-up of No. 9 turbine and the switching on of the new transmission line. He was glad that all classes of political thought were represented on that occasion. It occurred to him that very often they had political differences in trying, probably, to do the right thing from different stand-

points, but there were no differences whatever in political opinion, or in the opinion held by citizens generally, in the desire to express gratification to His Excellency for being there that day. (Applause.) To His Excellency they extended a sincere, and, in spirit, a royal welcome to Tasmania. (Hear, hear.) Tasmania was only a small State, but, as a public man, he knew, when they tried to get over it, how big it seemed. He had not yet seen the whole of Tasmania himself, and he could realise how much more difficult it must be for a man who occupied a high public position such as that occupied by the Governor-General, to traverse the whole of the State. It was the more gratifying on that account, however, that His Excellency had seen so much of this portion of the King's Dominions. (Applause.) He was glad to see also with them the deputy-leader of the Opposition (Mr. Belton), who had undertaken to second the vote of thanks which it was his (the Premier's) pleasure to propose to Lord Forster. It was during the occupancy of the office of Premier by Hon. J. Earle, as Labour Premier of the Government, that the Bill was introduced to enable the State to acquire the rights of the private company in connection with the hydro-electric scheme, and a start of the work was made, and the first portion of the 10,000 horse-power was completed. He (the Premier) had come to Waddamana with Lord Novar (formerly Sir Ronald Munro Ferguson) when the first unit of the huge undertaking was completed. There was now available 60,000 h.p. as the result of the enterprise, and engineers had been surveying and planning for further hydro-electric schemes for Tasmania. The General Manager (Mr. J. H. Butters) told him that surveys had been made for no less than 300,000 horse-power that could be constructed, developed, and sold at an economical price. Anyone seeing the extent of the hydro-electric enterprise in the State must come to the conclusion that they were only on the fringe of industrial development. Mr. Butters also told him that no hydro-electric work of the magnitude of that in Tasmania had been constructed in any part of the world under more adverse conditions, for the reason, among others, that when the enterprise was first planned there were no few facilities for carrying it out. There were no roads, and nothing but hardship, and when it was considered that the provision of colossal machinery capable of generating 60,000 h.p. was required, the difficulties under which the work was undertaken, commenced, and carried out could be imagined. The department, in coping with the many difficulties which had been so successfully surmounted, had been always blessed with a good loyal, and competent staff. If he started by mentioning the names of Mr. Evans (manager of the power-house), and Messrs. Halkyard, Chapman, Bastow, and Curtis, he would be but touching the fringe of those who had contributed so largely to the success of the work, and if he began to mention further names of those who had assisted, he would be sure to leave someone out. (Laughter.)

Hon. T. Murdoch: Don't forget our friend, Mr. Gillies.

The Premier: No, I must not forget him. Mr. Gillies was the originator of the scheme, and we are pleased to have him with us to-day. (Hear, hear.)

Continuing, the Premier said that Mr. Gillies' imagination and forethought had made it possible for the scheme to be brought about after coming through untold difficulties. Mr. Gillies was now associated with the carbide works,

which were a profound success. The works, which in effect were a partner with the hydro-electric scheme, were making over 100 tons of carbide a week. They were also glad to see with them Mr. F. M. Nicholl, who had been responsible for a great deal of the construction work in most critical times. Mr. Nicholl was no longer a member of the staff of the department, but had shown his interest in the consummation of the work. He could not remember the names of all those who had had something to do with the construction of their great scheme. He, however, was not likely to forget Mr. Butters. Mr. Butters had come in eleven years

ago, when there were no roads in the district, and when Bothwell was practically the nearest place at which stores could be obtained. At that time, there was nothing in the vicinity except a few shepherds' huts. Mr. Butters had then come with surveyors and surveying outfits, and was responsible for the scheme as they saw it that day. It was a scheme which any engineer might be proud to look upon as his life's work. (Applause.) Mr. Butters could have had infinitely more lucrative appointments, but the Tasmanian hydro-electric scheme was his life's work, and he had stuck to it. He (the Premier) hoped that Mr. Butters would still remain as general manager of the department, and see that the scheme developed to many times its present size. (Hear, hear.) He had already stated that the scheme was a big one; he might add that it had already drawn many industries to Tasmania. Mr. Gepp had come to the State with the huge undertaking he represented, which had spent from two to three millions of money in Tasmania, and had made it possible to manufacture in the State zinc which previously had been manufactured in Germany, making it also possible for a very large amount of money to be distributed in Australia. Mr. Hackett, of Cadbury-Fry-Pascall Ltd., was also doing great things among them; and when speaking of industries which had settled in the State, he might also mention undertakings in the northern part of the State, such as the woollen mills of Messrs. Kelsall and Kemp, and the spinning mills of Messrs. Pylon and Baldwin, and others. He had been accused of being optimistic. It was a fact that he was optimistic. He could not help being so when he saw the vast amount of potential power which yet remained untouched in the State. Tasmania was rich in grain crops and other sources of wealth, and in view of its immense natural resources everyone should be proud of the country. No doubt everyone was proud of it. (Applause.) They had natural resources in plenty, but what they wanted in the country was more work and fewer "dismal jiggies." All that they wanted to ensure the steady progress of the State was for them to "buck in and do things." Nearly all the 60,000 horse-power at their command had been sold, and Tasmanian people should very keenly appreciate the benefits the hydro-electric scheme had conferred on the State. There were now seven turbines at the power station of 8,000 h.p., and two of 5,000 h.p. The latest installed had been started by the Governor-General that day, and His Excellency, by the magic touch of his finger, had made available further power to supply the additional needs of Hobart and elsewhere. (Loud applause.)

THE "WHITE AND BLACK."

Mr. Belton, in seconding the vote of thanks, referred to the origin of the hydro-electric scheme. It was, he said, a struggle in the first instance to convince people that the scheme should be gone on with immediately, although everyone had realised its wonderful possibilities. At the present time the scheme had been carried to success, and there still remained large opportunities for development on the West Coast. He hoped the time would come when, with money not so dear and scarce, they would be able to get power to the other parts of the State, with less concentration at one end. They had no desire to see undue concentration anywhere. (Applause.) The outlook, he was sure, was good for the future. He congratulated the organisers of the scheme upon its manifest success. The greater part of Tasmania was represented at Waddamana that day, although there were not quite so many politicians present as he would have liked to see. There was one matter which gave him some little concern that was to see the colours white and black in such profusion. (Laughter.) The concern he felt was on account of the fact that they believed so strongly in their "White Australia" (laughter and applause)—and he knew His Excellency also believed in that policy. (Rewarded applause.) His Excellency also was a keen sportsman, who believed in good clean sport, and as such they appreciated his visit. In any case, he was pleased to see that white predominated in His Excellency's colours. (Applause.)



SENATOR JOHN EARLE,

who was Premier of Tasmania and leader of the Labour Party when he induced Parliament to purchase the Hydro-Electric scheme.



MR. J. H. BUTTERS,
General Manager of the Hydro-Electric Department.

He has been in charge of the construction since the inception of the scheme, first as Chief Engineer to the Company, and since as Engineer-in-Chief and General Manager for the State.

THE GOVERNOR-GENERAL'S REPLY.

When Lord Forster rose to acknowledge the thanks so warmly accorded him, he was loudly acclaimed. He said: I thank you, on behalf of Lady Forster and myself, for the cordial greeting given me and my wife, and assure you that it is a real pleasure for Lady Forster and myself to be here. (Applause.) Remark has been passed on the little family matter of colours. As to that, you will find no stronger supporter of the White Australia policy than myself. (Hear, hear.) Had Mr. Belton taken thought for a moment he would have remembered that the King I represent is the head of an Empire comprising black and white, and that the colours are therefore not out of place.

Mr. Belton: I did remember it, and that black should be represented in the Governor-General's family colours. (Applause.)

The Governor-General: The black may represent India and the White Australia, and standing together they form parts of the great British Empire, each in its own territory. (Applause.) It is a real pleasure to me to say how deeply I appreciate the privilege of being associated in the ceremony of to-day. Yesterday we had an extraordinarily exciting experience at the Great Lake, where, I think, is one of the most interesting engineering feats I have ever seen. The lake is most interesting, containing, as it does, the great dam built at that point of the works. With reference to the starting of the turbine and the switching on of the current, I congratulate all concerned in the initiation and



HON. J. B. HAYES, Premier.

As Minister of Works he has been head of the Hydro-Electric Department for the past six years, and closely associated with its development.



MR. J. H. GILLIES,

the originator of the Hydro-Electric scheme just completed. In face of enormous difficulties, geographical and financial, he had completed the first unit of 9,000 horse-power when in 1914 failure to raise additional capital necessitated sale to the Government. It was only by his dogged perseverance under discouragements that would have deterred most men that the works were ever begun.

completion of such a marvellous piece of work. (Applause.) One cannot go about Tasmania without being impressed by its natural resources. It is a wonderful thing that there should be a huge lake right on the mountain tops, and that a river should be diverted into the great lake in order to swell its waters. It is all very well, however, to have natural resources, but it wants brains to turn them to full account, and Tasmania is lucky in that she has natural resources, and the brains to turn them to account. I am delighted to think that my name will soon be given a place on the turbine I started up. I congratulate

those who had the combination of courage and enterprise to take hold of the work and develop it, and bring it to fruition. There is no possible question as to its effect in the development of Tasmania as a whole. You have a great distributing agency right in the middle of the island, and are able to divert power in every direction where it is required. I am proud to have my name associated with any part of such a great scheme. Cheap power is essential to the full development of industry, and I



HIS EXCELLENCY THE GOVERNOR-GENERAL,
LORD FORSTER.

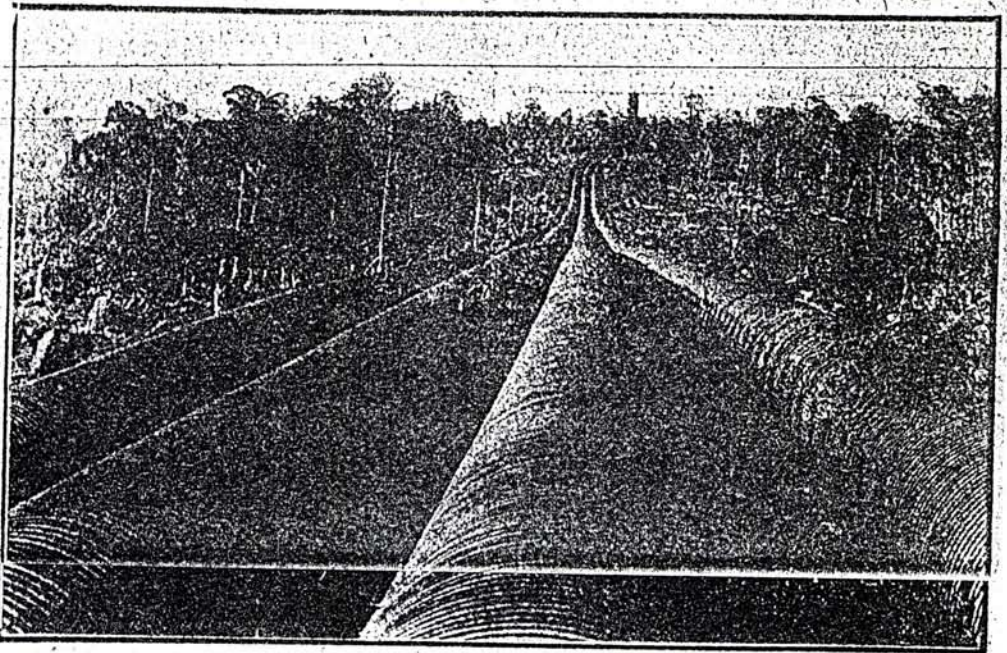
Who started No. 9 Turbine Yesterday.

19 JANUARY, 1923

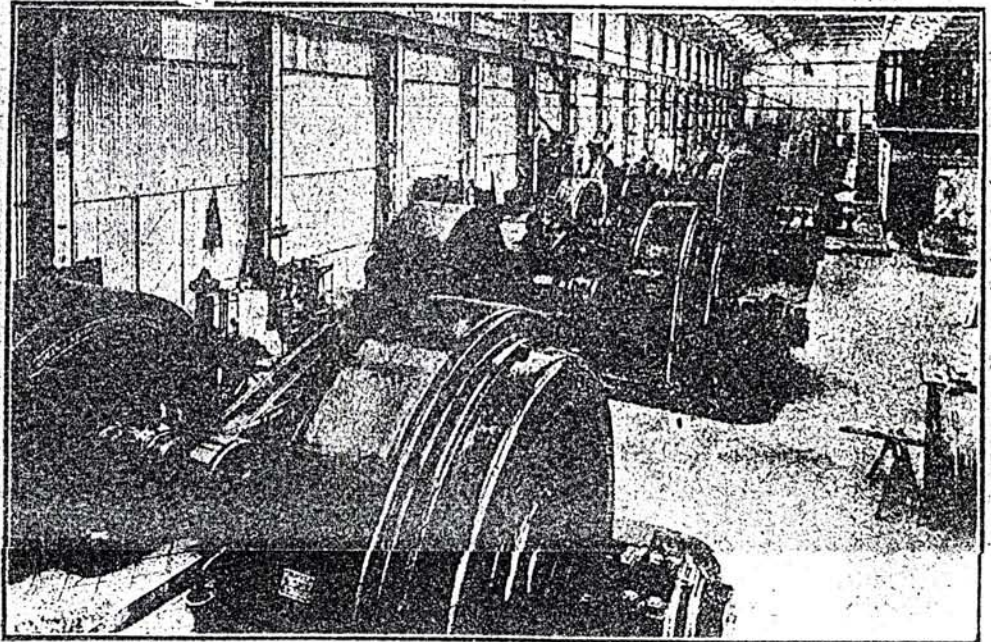
hope to see still greater industrial power developed in Tasmania and other parts of Australia. But something else is necessary, and that is peace. We hope in a short time—and the shorter the better—that more peaceful—and stable conditions may be obtained throughout the world, so that trade may be developed, and so ensure a brighter industrial prospect for the Commonwealth. We are sick and tired of death of the horror and waste of war, and hope we never may see war again. I remember when I was standing in the engine-room of a battleship which developed an enormous amount of power, and I could not help thinking of it as I stood in the power-house here to-day. I remember the engine of the battleship, and that the vessel was built for purely destructive purposes, and for nothing else. It was built, manned, and maintained for destruction. (The power-house I was in to-day was built, manned, and developed in order to do constructive work of general utility and welfare. What a difference! Unless we are absolutely sure of peace we must have battleships. There can be no question of that, and in the industrial world we cannot hope that this great undertaking can reach full fruition unless we have industrial peace. The subject lies close to my heart. It raises issues outside those which are open to a Governor-General, but I may remark that I am concerned in these matters, and that experience shows that we do depend on one another—that we have at bottom a broad basis on which our mutual prosperity may best be developed, and I hope and pray that we shall use often those words in the Bible, "Settle peace and ensue it" in all directions. Then I am certain that the great work will reach the fullest utility. I would like to express the wish that as this great work belongs to the people of Tasmania, and as the people of Tasmania in the future are the children of Tasmania to-day, and as we are lucky to meet in one of the schools of Tasmania, we should associate the school children with our function of to-day. I therefore express the hope that some suitable day will be selected, and shall ask the Minister of Education to see that all the children in the State get a whole holiday in celebration not only of our visit to the State, but of the purpose for which we have had the happiness to come to Tasmania. (Hear, hear.)

Cheers were given in conclusion, at the call of Hon. J. W. Evans, C.M.G., for Lord and Lady Forster, and the Governor-General, in response, simply, remarked, "Thank you very much."

The vice-regal party subsequently left for Hobart, and were entertained en route by Mr. E. O. Blizard and

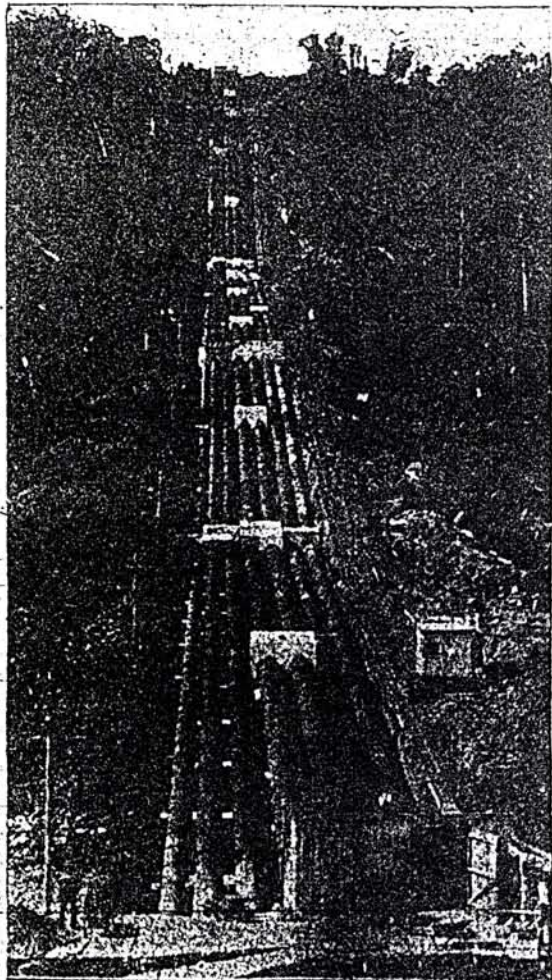


WOOD STAVE PIPE LINE, One 4ft. in diameter, and three 5ft.



WADDAMANA POWER STATION.

19 January 1923



STEEL PIPE LINES, one 24in. in diameter (riveted); two 36in. in diameter (welded); two 49in. in diameter (welded); and two 36in. (lockbar).

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Hydro-Electric Department 1914-15 to 1928-29

ARCHIVAL MATERIAL

Agreement between the Hydro-Electric Department and the Launceston Council 1918. H.E.C. Archives.

**WADDAMANA 'A' POWER STATION
TASMANIA**

**NATIONAL ENGINEERING LANDMARK
PLAQUING CEREMONY**

18TH FEBRUARY 1995

REPORT

TASMANIA'S FIRST NATIONAL ENGINEERING LANDMARK

WADDAMANA 'A' POWER STATION

On Saturday the 18th February 1995 a ceremony was held at Waddamana to dedicate the 'A' power station as a National Engineering Landmark.

The plaques were presented, on behalf of the Institution, by Dr. John Webster the Chief Executive Officer representing Professor Douglas Clyde who was unable to attend at short notice. They were then unveiled by the Minister for Transport and Works, Hon. Ian Braid representing the Minister for Energy, Hon. Robin Gray who was also unable to attend at relatively short notice.

Hon. Peter Rae, Chairman of the Hydro Electric Commission received the plaque on behalf of the H.E.C. and spoke of the importance of hydro power to Tasmania and the need to conserve the State's water resources. He was supported by Mr. Paul Salmon, Operations Manager of Pasminco Metals-EZ and Mr. Geoff Ashton-Jones, Mayor of the Tasmanian Highland Council.

The Tasmania Division President, Mr. John Brodribb thanked the speakers and the Engineering Heritage Committee for organising the event. In inviting the visitors to afternoon tea he thanked the HEC and Pasminco for sponsoring the occasion and also the Highland Council for providing the chairs for the 80 or so visitors who attended on what proved to be a most enjoyable day. The several speakers were introduced by the Heritage Committee Chairman, Mr. Keith Drewitt.



K.C. DREWITT, MIEAust., CPEng.,

Chairman,
Engineering Heritage Committee.

YOU ARE ALL INVITED!!!!

WADDAMANA "A" POWER STATION

On Saturday, 18th February 1995 a ceremony will be held at Waddamana to unveil a National Engineering Landmark plaque to commemorate the first major hydro-electric power station in Australia and the contribution of (Sir) John Butters who was the first Chairman of the Tasmania Division.

Professor Douglas Clyde, Hon. Robin Gray, Hon. Peter Rae, Mr. Paul Salmon and Mr. Geoff Ashton-Jones will officiate the ceremony which will commence at 2.30pm.

Members are invited to attend and have an enjoyable family day out. Electric barbecues are available on site for those wanting to have a picnic lunch.

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Waddamana

Much has been said already about the commemoration of Waddamana power station and with the recent ceremony, there will be more to follow. However, I must congratulate Keith Drewitt and Henry McFie (the photogenic ones) and their enthusiastic team for the magnificent coverage they have achieved of the event. Do I see new careers in public relations developing?

Peter Greenwood, FIEAust., CPEng.
President
Tasmania Division

March 1995

NATIONAL ENGINEERING LANDMARK

Recognition of the work of Dr. Giudici's predecessors, the early Tasmanian engineers developing an electrical power supply, has been achieved with the acceptance of the Waddamana "A" power station for plaquing as a National Engineering Landmark. Award of the National Engineering Landmark is the highest heritage award bestowed by the

Institution, is only granted after extensive assessment and generally only one a year, throughout Australia. Institution President, Professor Douglas Clyde, the Hon. Robin Gray MHA, Minister for Energy and Mr. Peter Rae, Chairman of the Hydro Electric Commission, will participate in the plaquing ceremony at Waddamana at 2.30pm on Saturday, 18th February 1995.

My thanks are extended to the Engineering Heritage Group Chairman, Keith Drewitt and his team for their development of the National Engineering Landmark proposal and their efforts in arranging the event.

JOHN A. BRODRIBB, FIEAust.
CPEng.
President,
Tasmania Division.

Feb 1995

Extracts from TAS Division monthly newsletter



THE INSTITUTION OF ENGINEERS, AUSTRALIA

The President of the Tasmania Division
and the Chairman and Members of the
Engineering Heritage Committee
cordially invite



to attend a ceremony at **Waddamana**
on Saturday, 18th February 1995 at 2.30p.m.
to commemorate

THE WADDAMANA "A" POWER STATION
with the unveiling of a
NATIONAL ENGINEERING LANDMARK PLAQUE
by
the Hon. Robin Gray, Minister for Energy

R.S.V.P. by Wednesday, 8th February 1995
Tel: (002) 34 2228

Afternoon tea will be
served after the Ceremony

HISTORICAL NOTE

An extract from the Governor-General's reply printed in the Hobart *Mercury* on Friday, 19th January 1923.

"It is a real pleasure to me to say how deeply I appreciate the privilege of being associated in the ceremony of today. Yesterday we had an extraordinarily exciting experience at the Great Lake, where, I think is one of the most interesting engineering feats I have ever seen. The lake is most interesting, containing, as it does, the great dam built at that point of the works. With reference to the starting of the turbine and the switching on of the current, I congratulate all concerned in the initiation and completion of such a marvellous piece of work. (Applause) One cannot go about Tasmania without being impressed by its natural resources. It is a wonderful thing that there should be a huge lake right on the mountain tops, and that a river should be diverted into the great lake in order to swell its waters. It is all very well, however, to have natural resources, but it wants brains to turn them to full account, and Tasmania is lucky in that she has natural resources and the brains to turn them to account. I am delighted to think that my name will soon be given a place on the turbine I started up. I congratulate those who had the combination of courage and enterprise to take hold of the work and develop it, and bring it to fruition. There is no possible question as to its effect in the development of Tasmania as a whole. You have a great distributing agency right in the middle of the island, and are able to divert power in every direction where it is required. I am proud to have my name associated with any part of such a great scheme. Cheap power is essential to the full development of industry and I hope to see still greater industrial power developed in Tasmania and other parts of Australia."

His Excellency The Governor General,
Lord Forster



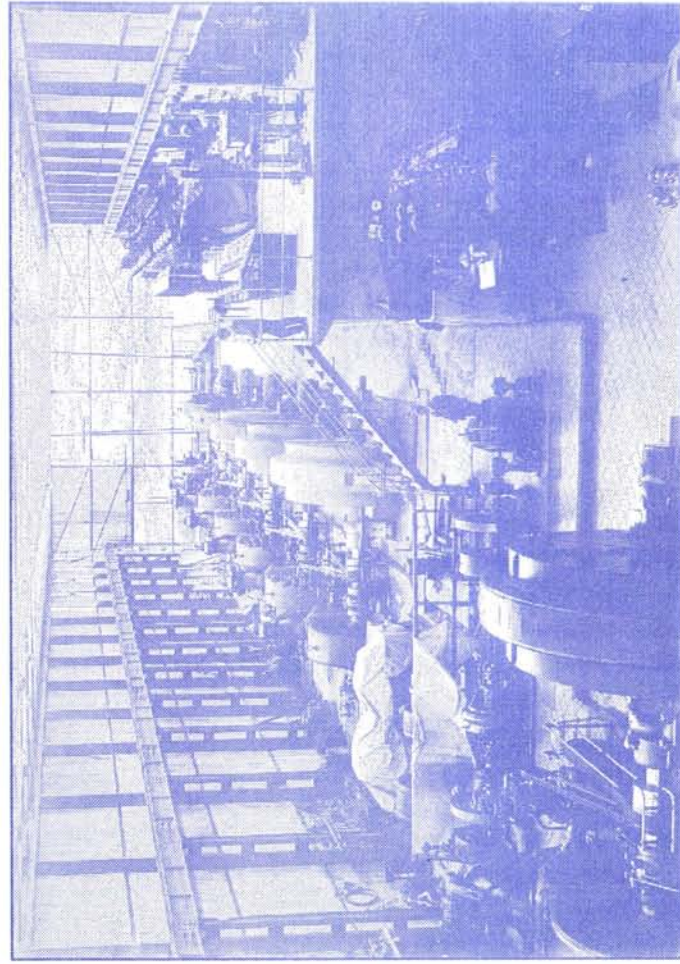
THE INSTITUTION OF ENGINEERS, AUSTRALIA

Official Ceremony
for the unveiling of a

NATIONAL ENGINEERING LANDMARK PLAQUE

WADDAMANA "A" STATION

1916-1965



Program for the Ceremony to be held at Waddam
on Saturday, 18th February 1995 at 2.30p.m.

Co-Sponsors **H.E.C. and Pasminco Metals - E.Z.**

Master of Ceremonies

Mr. Keith Drewitt, MIEAust.
Chairman of Tasmania Division Engineering Heritage Committee

Welcoming Address and Presentation

Professor Douglas Clyde, FIEAust.
President, The Institution of Engineers, Australia

Unveiling of National Engineering Landmark Plaque

Hon. Robin Gray, MHA
Minister for Energy

Responses:

Hon. Peter Rae
Chairman, Hydro Electric Commission

Mr. P.T. Salmon
General Manager, Pasminco Metals - E.Z. Risdon

Mr. G. Ashton-Jones
Warden, Highland Council

Conclusion

Mr. John Brodribb, FIEAust.
President, Tasmania Division, Institution of Engineers, Australia

WADDAMANA "A" POWER STATION

Constructed 1911 - 1923

In Service 1916 - 1965

In 1907 a need arose for a cheap bulk electricity supply in Tasmania for metallic ore reduction. Economic electricity transmission over long distances had only just become available and the Complex Ores company designed and started construction of a scheme utilising the water of the Great Lake.

Construction of the scheme including Waddamana "A" power station commenced in 1911 and the first stage was finished by the Tasmanian government in 1916 after the company experienced financial difficulties.

The station was completed in 1923 and remained in continuous service until 1965 when water from the Great Lake was utilised more efficiently in a new power station at Poatina.

Since removal from service Waddamana "A" station has become a museum to display Tasmanian electricity generation and associated memorabilia.

PHOTOS OF CEREMONY IN PROGRESS

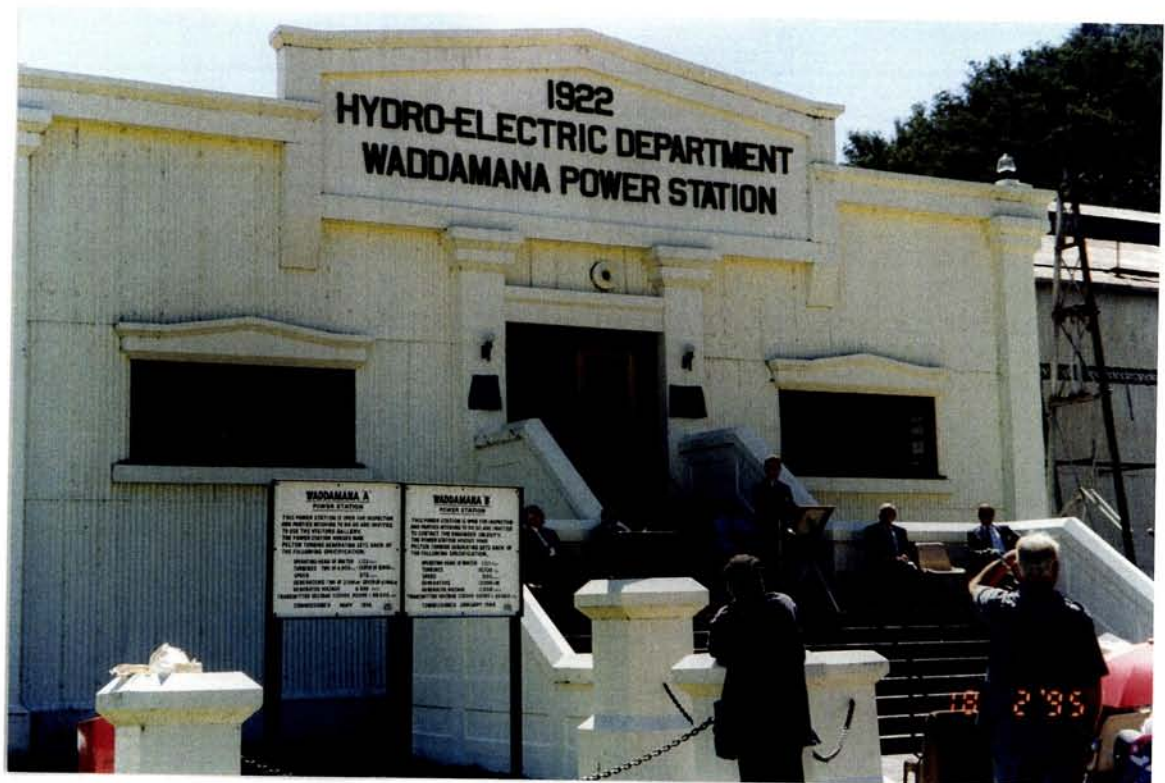


**MR. KEITH DREWITT
INTRODUCING THE SPEAKERS**



PART OF ASSEMBLED VISITORS

WADDAMANA 'A' POWER STATION



**DR. JOHN WEBSTER - I.E. Aust.
PRESENTATION ADDRESS**



PART OF ASSEMBLED VISITORS



**DIRECTOR OF CEREMONIES
MR. KEITH DREWITT**

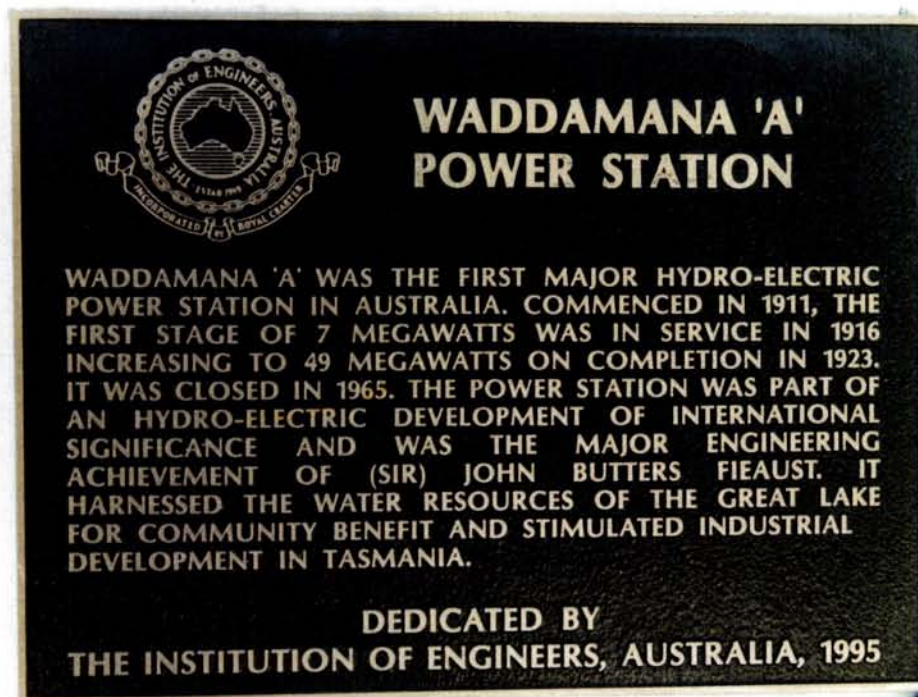


**MINISTER FOR WORKS, HON. IAN BRAID
UNVEILING INFORMATION PLAQUE**

WADDAMANA 'A' POWER STATION



LANDMARK PLAQUE



INFORMATION PLAQUE

TASMANIA'S FIRST NATIONAL ENGINEERING LANDMARK

WADDAMANA 'A' POWER STATION

On Saturday 18th February, 1995, the Institution organised a dedication ceremony at Waddamana, when a plaque was unveiled by Minister for Transport and Works, Hon Ian Braid, MHA representing Ministry for Energy, Hon Robin Gray, MHA to commemorate the establishment of the first major hydroelectric power station in Australia.

The station commenced operation in 1916, and the last machine (No 9) was brought on line in 1923 when the installed capacity was 63,000 horse power. At that time the Pasminco Metals-EZ works at Risdon used about 15,000 horse power.

Dr John Webster, Executive Officer of the Institution presented the plaques, representing the President of the Institution, Professor Clyde who was prevented from attending by family illness.

Hon Peter Rae, Chairman of the HEC received the plaque on behalf of the HEC, and spoke of the importance of hydro power to Tasmania and the need to conserve the State's water resources. He was supported by Mr Paul Salmon, Operations Manager of Pasminco Metals-EZ, and Mr Geoff Ashton-Jones, Mayor of the Tasmanian Highland Council.



Waddamana A Power Station - Unveiling of N.E.L. on Saturday 18 February 1995
L to R Messrs P. Salmon, G. Ashton-Jones, I. Braid MHA, K. Drewitt, P. Rae, J. Webster, J. Brodribb

Our President, Mr John Brodribb thanked the speakers and the Engineering Heritage executive for organising the event, and the HEC and Pasminco who had sponsored the occasion, providing afternoon tea for invited guests.

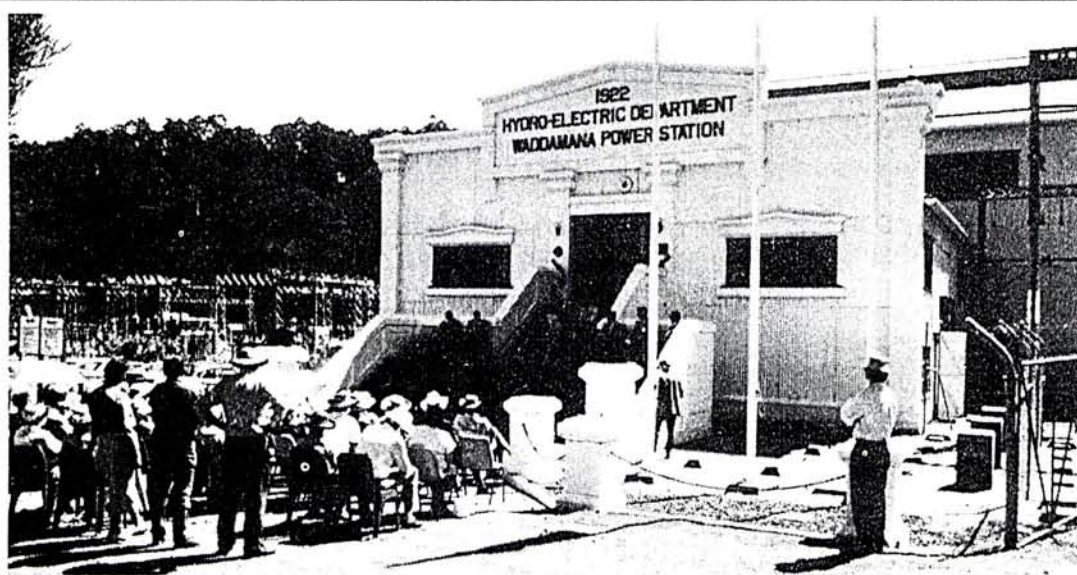
It was gratifying to see so many descendants of past station staff and interested engineers and families present. One ex-HEC member had been present at the opening in 1916 as a babe-in arms.

Thanks are extended to former HEC staff who acted as voluntary guides in the Museum on the day.

Afternoon tea was provided in one of the cottages by Mr and Mrs Cooper, the owners of the Waddamana Field Study Centre.

The Highland Council provided chairs for the 80 or so who attended on what proved to be a most enjoyable day. If you would like to inspect the plaque and the museum in the 'A' Station, why not consider ringing the Waddamana Field Study Centre and arrange to hire a cottage for the night and explore the area. The museum is open during normal working hours, but you should check weekend times with the HEC or Mr Cooper. We need to be always conscious that museums and other preserved places cost money to maintain, therefore if we fail to show our interest we may lose something we take for granted, especially in this dollar-driven age.

David Freestun,
Hon Sec
Engineering Heritage
Committee



Waddamana A Power Station - Tasmania- Unveiling of N.E.L. on Saturday 18th February 1995 - Plaques on left and right of entrance doorway.